Preface

This manual of notes and worksheets was developed by Teri E. Christiansen at the University of Missouri-Columbia. The goal was to provide students in Math 1100 (College Algebra) a resource to be used for both taking notes and working problems for additional practice. The structure of the notes and assignments parallels the contents of the textbook *College Algebra*, Version 3, by Carl Stitz and Jeff Zeager (http://www.stitz-zeager.com/), with minor exceptions. Definitions and exercises were often inspired by the material in the textbook.

In most cases, it is far cheaper to purchase a printed version of this workbook from the MU bookstore than it is to print the materials at home. No royalties will be received by any of the authors or their employers from the sale of either the text or workbook.

The version of the textbook that has been modified specifically for Math 1100 at MU is available at:

http://www.math.missouri.edu/courses/math1100/CABook.pdf

Math 1100

Lab Worksheet #1 (Section 0.1)

Name: .....

Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

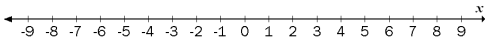
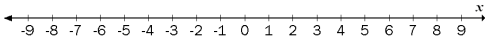
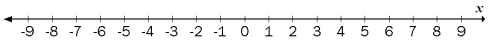
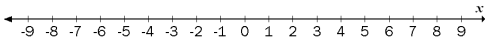
1. Consider the following numbers: $-43.89, 12, -3, -\frac{1}{5}, \sqrt{7}, 1.81881888188881\ldots, \sqrt[3]{10}, \frac{\sqrt{16}}{\sqrt{9}}, 0, 3.\overline{1}$

   (a) Which are integers?

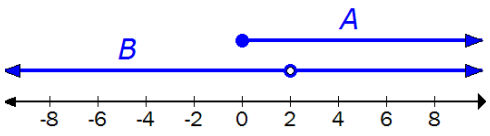
   (b) Which are irrational numbers?

   (c) Which are rational numbers, but not integers?

2. Complete the table below.

Set Notation	Interval Notation	Graph
$\{x \mid -2 < x \leq 0 \text{ or } x \geq 4\}$		
$\{x \mid x \neq -5, 5\}$		
$\{x \mid x \leq 0 \text{ and } x \neq -3\}$		
$\{x \mid x \geq 4 \text{ or } x = -5\}$		

3. Given the sets shown on each graph below, find interval notation for each of the sets listed.

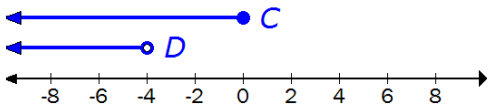


(a) A

(b) B

(c) $A \cup B$

(d) $A \cap B$



(e) C

(f) D

(g) $C \cup D$

(h) $C \cap D$

Math 1100 Name: .....

Lab Worksheet #2 (Section 0.2) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Perform the indicated operations and simplify.

(a) $3 + \frac{4}{7} - \frac{2}{3}$

(b) $\left(\frac{1}{6} - \frac{1}{5}\right) \div \frac{7}{10}$

(c) $\dfrac{4}{\frac{1}{3} + \frac{3}{5}}$

(d) $5^{-2} + (-4)^{-1}$

(e) $\dfrac{3^{15} \cdot (2^9 \cdot 2^4)^2}{3^{12}}$

(f) $\dfrac{2 + 3^{-2}}{1 - 2^{-1}}$

(g) $7^2 - 12 \div 2^2 \cdot 4 - 8$

(h) $3 - 2[4 - 3(-1 + 5)]^2 - (-1)(-5)$

(i) $1000^{1/3} - 4^{-3/2}$

(j) $\sqrt{18} - \sqrt{2}$

(k) $\dfrac{-2 + \sqrt{2^2 - 4(-5)(2)}}{2(-5)}$

(l) $\sqrt{(2-(-1))^2 + (\frac{1}{2} - 3)^2}$

2. Use rules of exponents to find the missing expression(s) (marked with a ?).

(a) $\dfrac{1}{1000} = 10^{?}$

(b) $9^{2x+3} = 3^{?}$

(c) $\dfrac{X^{3a-1}}{(X^a)^5 \cdot X} = X^{?}$

(d) $\dfrac{1}{\sqrt[8]{b^3}} = b^{?}$

(e) $\dfrac{M\sqrt{M}}{\sqrt[3]{M^2}} = M^{?}$

(f) $x^{27} - 64y^{21} = (?)^3 - (?)^3$

Math 1100 Name: .....

Lab Worksheet #3 (Section 0.3) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve.

(a) $3[5-3(4-t)]-2=8-3(5t-4)$

(b) $\dfrac{3-2t}{4}=2t+1-\dfrac{3t+1}{6}$

(c) $\dfrac{49w-14}{7}=3w-(2-4w)$

(d) $A=P+Prt$, for P

(e) $a=\frac{2}{3}b(c-2d)$, for d

(f) $2a(b-3)=4b-5$, for b

2. Solve. Write your answer using interval notation.

(a) $3 - \dfrac{4t-3}{5} < 2t - \frac{1}{2}$

(b) $7 - (2 - x) \leq x + 3$

(c) $-\dfrac{3}{2} \leq \dfrac{4-2t}{10} < 7$

(d) $3 - y > 7 \quad \text{or} \quad 4 + 2y \leq 1$

(e) $\dfrac{5-2x}{3} > x \quad \text{or} \quad 2x + 5 \geq 1$

(f) $1 \leq 1 - x \quad \text{and} \quad 4 - 5x \leq 7x$

Math 1100 Name: .....

Lab Worksheet #4 (Section 0.4) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve. For inequalities, write the solution using interval notation.

   (a) $12 - |\frac{1}{2}x - 5| = 9$

   (b) $|3x + 1| + 4 = -1$

   (c) $4 - |3x + 1| = 1$

   (d) $|6 - 4x| \leq 8$

   (e) $\left|\frac{5x - 4}{2}\right| - 7 \geq 1$

   (f) $|x + 2| + 5 < 2$

Math 1100 Name: .....

Lab Worksheet #5 (Section 0.5) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Perform the indicated operations and simplify:

   (a) $(5x^3 - 7x + 11) - (2x^2 + 9x - 3) - (8x^3 - 4x^2 - 7)$

   (b) $(\frac{1}{5} - 5x)(2x + \frac{1}{2})$

   (c) $(x^2 - y^2)(x + y)$

   (d) $3x^3(x - 4y)(x + 4y)$

   (e) $-2x(5 - x)^2$

   (f) $(a + 3b)(2a^2 + ab + b^2)$

   (g) $(2x + y - 1)(2x + y + 1)$

   (h) $(4x - 3)(2 - x) - (2x - 5)^2$

2. Use long division to find the quotient and remainder. Check your answer by showing that *dividend = (divisor)(quotient) + remainder*.

   (a) $(6x^3 - 2x^2 + 4x - 1) \div (x - 3)$

   (b) $\dfrac{4x^5 - 7x^3 + x^2 + 10x - 11}{x^2 + 1}$

Math 1100 Name: .....

Lab Worksheet #6 (Section 0.6) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Factor completely (over the integers):

   (a) $2rs + 10s - r - 5$

   (b) $4x^3 - 4x^2 - 9x + 9$

   (c) $16x^2 - 25$

   (d) $5a^3b^3 - 20a^3b$

   (e) $3x^2 - 8x - 11$

   (f) $3y^2 + 7y - 20$

   (g) $8p^3 + 1$

   (h) $8x^2 + 2xy - 15y^2$

(i) $x^4 + 35x^2 - 36$

(j) $b^6 - b^3 - 2$

(k) $6(2p + 3)^2 - 5(2p + 3) - 25$

(l) $(y - 1)^4 - (y - 1)^2$

2. Solve.

(a) $x^2 = 5x$

(b) $x^2 + 5x = 14$

(c) $3t^2 + 4 = 8t$

(d) $y(y + 7) = 18$

(e) $(3x^2 + 7x - 20)(x^2 - 4x) = 0$

Math 1100 Name: .....

Lab Worksheet #7 (Section 0.7) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve using the method described.

   (a) $3(x-\frac{1}{2})^2=\frac{5}{12}$ (extracting square roots)

   (b) $4-(5t+3)^2=3$ (extracting square roots)

   (c) $y^2+8y+11=0$ (completing the square)

   (d) $2x^2-6x-1=0$ (completing the square)

   (e) $2t^2-3t-4=0$ (quadratic formula)

   (f) $x^2=x-1$ (quadratic formula)

2. Solve.

(a) $5x(x+2) = -3$

(b) $(3y-1)(2y+1) = 5y$

(c) $t^4 + t^2 - 6 = 0$

(d) $3(y^2-3)^2 - 2 = 10$

(e) $(2-y)^4 = 3(2-y)^2 - 2$

(f) $(t^2-4)^2 - 7(t^2-4) - 8 = 0$

Math 1100 Name: .....

Lab Worksheet #8 (Section 0.8) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Perform the indicated operation and simplify:

(a) $\dfrac{3x-x^2}{x^3-27}\cdot\dfrac{x^2+3x+9}{x}$

(b) $\dfrac{2a^2-2b^2}{a^3+a^2b+a+b}\div\dfrac{6a^2}{a^3+a}$

(c) $\dfrac{7}{x-1}+\dfrac{10x}{x^2-1}-\dfrac{5}{x+1}$

(d) $\left(\dfrac{x}{x+1}-\dfrac{x}{x-1}\right)\div\dfrac{x}{2x+2}$

(e) $\dfrac{\dfrac{x}{9}-\dfrac{1}{x}}{1+\dfrac{3}{x}}$

(f) $\dfrac{\dfrac{1}{x+1}-\dfrac{1}{x}}{\dfrac{1}{x+1}+\dfrac{1}{x}}$

(g) $\dfrac{x^{-1}+y^{-1}}{x^{-3}+y^{-3}}$

2. Solve:

(a) $\dfrac{3}{3x+4}-2=\dfrac{-2}{x-1}$

(b) $\dfrac{x^2-x-11}{x^2-x-6}+\dfrac{2}{3-x}=\dfrac{1}{x+2}$

(c) Solve for y: $\quad x=3-\dfrac{2}{1-y}$

(d) Solve for R_1: $\quad \dfrac{1}{R}=\dfrac{1}{R_1}+\dfrac{1}{R_2}$

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Lab Worksheet #9 (Section 0.9) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Simplify. Assume that all variables represent positive real numbers.

(a) $\sqrt{162c^4d^6}$

(b) $\sqrt[3]{64m^5n^{10}}$

(c) $\sqrt[3]{4(x+1)^2}\sqrt[3]{18(x+1)^5}$

(d) $\dfrac{\sqrt{128a^2b^4}}{\sqrt{16ab}}$

(e) $\sqrt[5]{\dfrac{4t^6}{r}}\sqrt[5]{\dfrac{8t}{r^6}}$

(f) $(\sqrt{x}-\sqrt{27})(\sqrt{x}+\sqrt{3})$

(g) $\left(\sqrt{5}+\sqrt{\dfrac{x}{5}}\right)^2$

2. Rationalize the denominator: $\dfrac{4}{\sqrt{10}-2}$

3. Rationalize the numerator: $\dfrac{\sqrt{x}-\sqrt{a}}{x-a}$ (Hint: Leave the denominator factored.)

4. Solve:

(a) $\sqrt[4]{x^2-1}=1$

(b) $\sqrt{6x+7}-x=2$

(c) $\sqrt{2x+5}-x+5=0$

(d) $t^{2/3}-1=8$

(e) $\dfrac{(3x-1)^5}{4}-8=0$

(f) $\dfrac{3}{15+4t^3}=2$

Math 1100 Name: .....

Lab Worksheet #10 (Section 1.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. If the point (p, q) is located in the fourth quadrant, in which quadrant is the point $(q, -p)$?

2. Consider the points $A(-\frac{3}{5}, -1)$, $B(\frac{2}{5}, \frac{1}{3})$, $C(-6, 0)$, and $D(3, -1)$.

   (a) List the quadrant or axis in/on which each point lies.

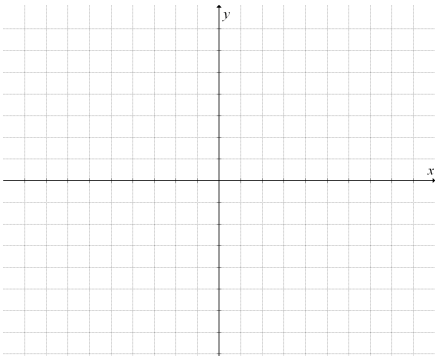
   (b) Find the point which is symmetric with A about the x-axis.

   (c) Find the point which is symmetric with B about the y-axis.

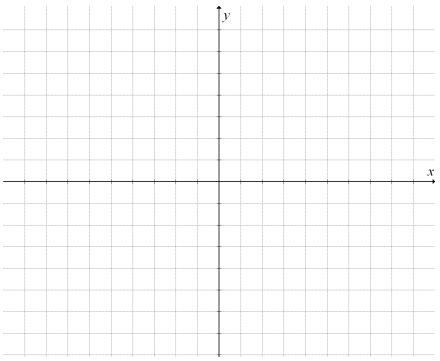
   (d) Find the point which is symmetric with D about the origin.

3. Determine whether the graph of each equation is symmetric about the x-axis, y-axis, or the origin. Sketch the graph.

   (a) $y = 2x^2 + 9$



   (b) $x = y^3$



Math 1100

Lab Worksheet #11 (Section 1.3)

Name: .....

Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Determine whether the relation is a function. Identify the domain and range.

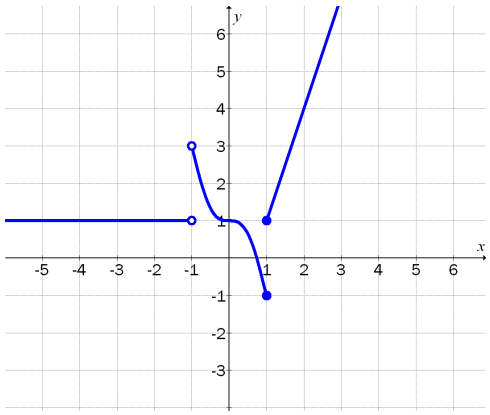
(a) $\{(3,1),(4,1),(5,1),(6,5),(2,4)\}$

(b) $\{(1,4),(2,5),(3,5),(2,4),(1,3)\}$

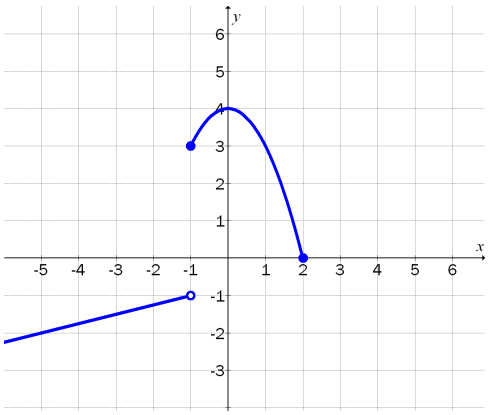
(c) $\{(x,|x|) \mid x \text{ is a real number }\}$

(d) $\{(|x|,x) \mid x \text{ is a real number }\}$

(e)



(f)



Math 1100 Name: .....

Lab Worksheet #12 (Section 1.4) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Given that $f(x) = 5x^2 - 8x$, and $g(x) = \dfrac{3-x}{x}$, find the following:

   (a) The domain of f

   (b) The domain of g

   (c) $f(-2)$

   (d) $g(0)$

   (e) $f(1) + g(2)$

   (f) $g(-3t)$

   (g) $f(-x)$

   (h) $g(2x)$

   (i) $f(a+1)$

   (j) $g(x+h)$

2. Find the domain of the function (in interval notation):

   (a) $f(x) = \sqrt{9-3x}$

   (b) $g(x) = \dfrac{5}{\frac{1}{3x} - 2}$

   (c) $h(t) = \dfrac{5-\sqrt{2t}}{6t-4}$

   (d) $k(t) = \dfrac{6t-4}{5-\sqrt{2t}}$

3. Given $f(x) = \begin{cases} \frac{3}{4}x + 2 & \text{for} \quad x \leq -1 \\ \frac{6-x}{2} & \text{for} \quad -1 < x < 2 \\ -2 & \text{for} \quad x \geq 2 \end{cases}$, find:

(a) $f(-3) =$

(b) $f(-1) =$

(c) $f(0) =$

(d) $f(2) =$

(e) $f(4) =$

(f) $f(-2) - f(1) =$

4. Use the given function f to find $f(0)$ and solve $f(x) = 0$.

(a) $f(x) = 9x^2 - 5x - 4$

(b) $f(x) = \dfrac{2x^2 - 8x}{x + 2}$

5. Find an expression for $f(x)$ and state its domain given that f is the function that takes a real number x and performs the following steps in order:

(1) add 10,

(2) take the square root,

(3) subtract 3,

(4) make the quantity the denominator of a fraction with numerator 5.

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Lab Worksheet #13 (Section 1.5) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Given the two functions below, find:

$$f(x) = \begin{cases} |x+1| & \text{if} \quad x < 0 \\ x^2 - 3 & \text{if} \quad x \geq 0 \end{cases} \qquad g(x) = \begin{cases} \sqrt{4-x^2} & \text{if} \quad -2 \leq x < 2 \\ x^{-1} & \text{if} \quad x \geq 2 \end{cases}$$

(a) $(f+g)(3)$

(b) $(g-f)(1)$

(c) $(fg)(0)$

(d) $(g/f)(2)$

2. Find and simplify the difference quotient $\left(\dfrac{f(x+h)-f(x)}{h}\right)$ for:

(a) $f(x) = 4 - 9x$

(b) $f(x) = x^2 - 2x + 4$

(c) $f(x) = \dfrac{1}{2x-3}$

3. Consider the functions $f(x) = x^2 + 4$, $g(x) = \dfrac{1}{x-3}$, and $k(x) = \sqrt{x+1}$. Find the following (if it exists):

(a) $(g - f)(x)$

(b) The domain of $g - f$

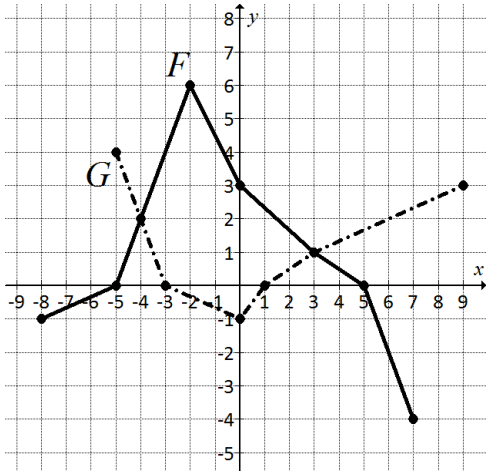
(c) $(f/k)(x)$

(d) The domain of f/k

(e) $(k/g)(x)$

(f) The domain of k/g

4. Given the graphs of F and G below, find the following:



(a) Domain of F: _____

(b) Domain of G: _____

(c) Domain of $F + G$: _____

(d) Domain of F/G: _____

(e) Domain of G/F: _____

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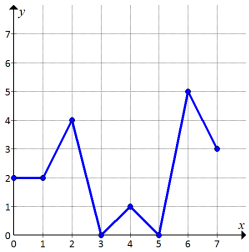
Lab Worksheet #14 (Section 1.6) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Given the graphs of $y = f(x)$ and $y = g(x)$ below, find the function values.

$y = f(x)$



$y = g(x)$

(a) $(f + g)(1)$

(b) $(f - g)(3)$

(c) $(fg)(2)$

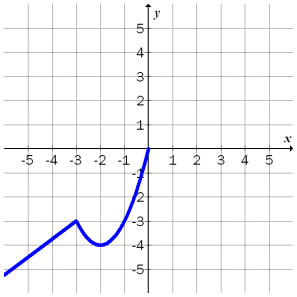
(d) $(\frac{f}{g})(0)$

(e) $(g - f)(5)$

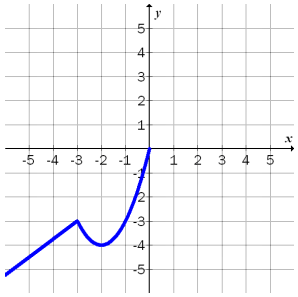
(f) $(\frac{g}{f})(6)$

2. Given the partial graph of a function below, sketch the remaining part of the graph for a function that is:

(a) Even



(b) Odd

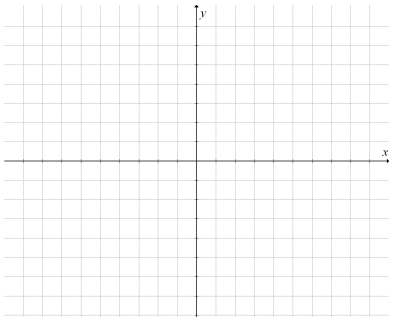


3. Graph the function $f(x) = 4x - x^2$, and find the information below:

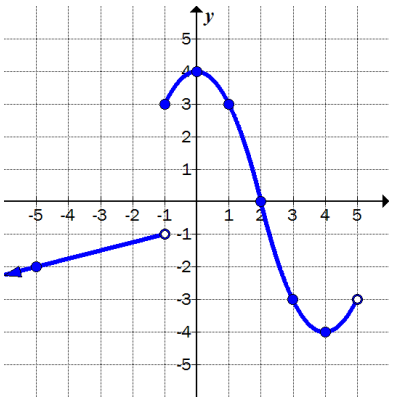
(a) x-intercepts

(b) y-intercept

(c) Use your graph to solve $f(x) > 0$



4. Use the graph of $y = f(x)$ shown below to answer the questions.



(a) Find the domain of f.

(b) Find the range of f.

(c) Determine $f(3)$.

(d) Solve $f(x) = 4$.

(e) List the x-intercepts, if any.

(f) List the y-intercepts, if any.

(g) Find the zeros of f.

(h) Solve $f(x) \leq 0$.

(i) Find the number of solutions to $f(x) = -3$.

(j) Does f appear to be even, odd, or neither?

(k) List the intervals where f is increasing.

(l) List the intervals where f is decreasing.

(m) Find the local maximums, if any.

(n) Find the local minimums, if any.

(o) Find the maximum, if any.

(p) Find the minimum, if any.

5. Determine analytically whether the function is even, odd, or neither.

(a) $f(x) = x + \dfrac{1}{x}$

(b) $g(x) = x^3 - 2x + 4$

(c) $h(x) = \sqrt{16 - x^2}$

(d) $k(x) = \dfrac{10x}{x^2 + 1}$

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Lab Worksheet #15 (Section 1.7) Student ID: .....

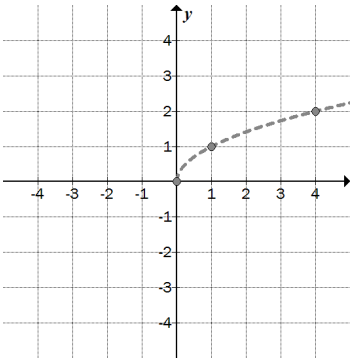
In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. The point $(18, -6)$ is on the graph of $y = f(x)$. Find a point on the graph of:

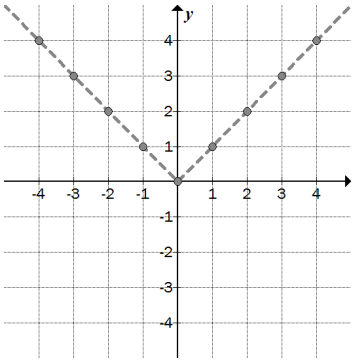
   (a) $g(x) = f(-x)$ (b) $g(x) = f(2x) + 1$ (c) $g(x) = 4f(x - 1)$

2. Describe in words how the graph of the function can be obtained from either $y = \sqrt{x}$ or $y = |x|$. Then, graph the function.

   (a) $f(x) = -\sqrt{x - 1}$

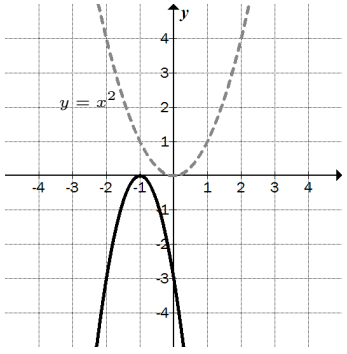


   (b) $g(x) = |\frac{1}{3}x| - 4$

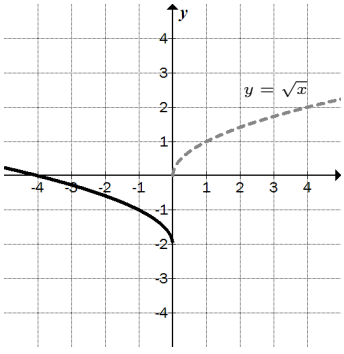


3. Write an equation for a function that has the shape of $y = x^2 + x$, but reflected over the x-axis, and shifted up 4 units.

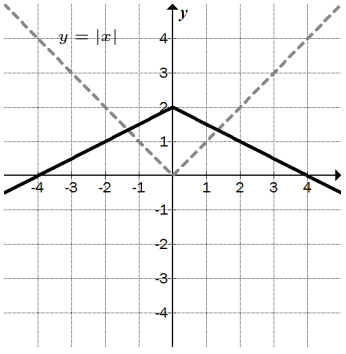
4. The graph below represents a transformation of the graph of $y = x^2$, $y = \sqrt{x}$, or $y = |x|$. Find the equation of the function which is graphed.



$y =$_____

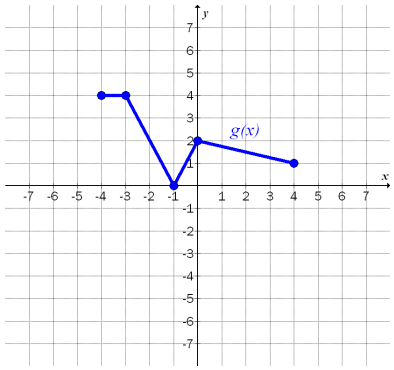


$y =$_____

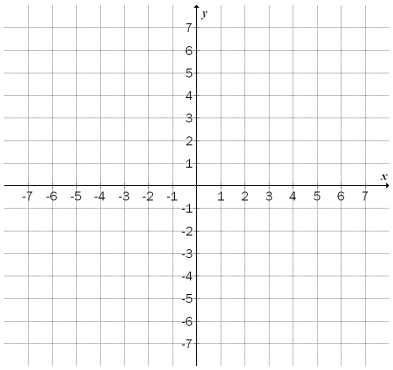


$y =$_____

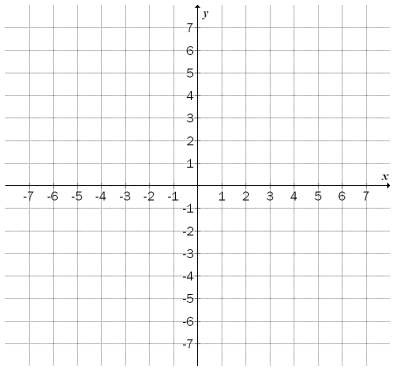
5. The graph of $g(x)$ is shown below. Sketch the graph of each equation using transformations.



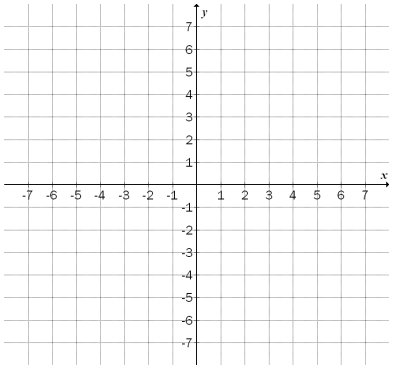
(a) $g(x+1)-5$



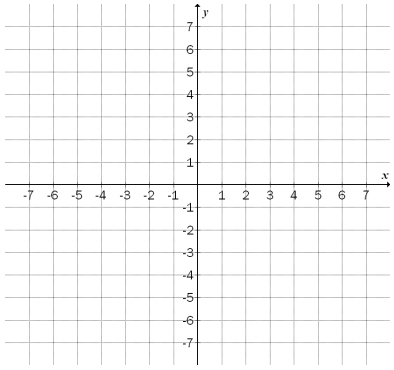
(b) $-g(2x)$



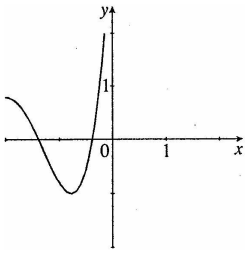
(c) $-\frac{1}{2}g(x-3)$



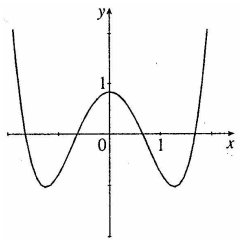
(d) $g(-x)+1$



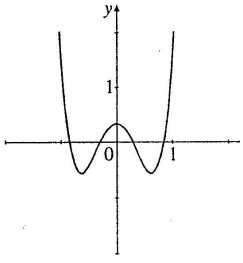
6. Below are five graphs. One is the graph of a function $f(x)$, and the others include the graphs of $2f(x)$, $f(2x)$, $f(x+2)$ and $2f(x+2)$. Determine which is the graph of $f(x)$, and match the other functions with their graphs.



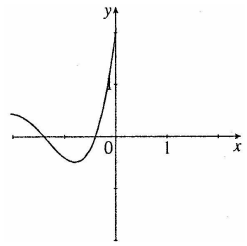
Function: .....



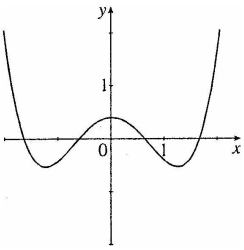
Function: .....



Function: .....



Function: .....



Function: .....

Math 1100 Name: .....

Lab Worksheet #16 (Section 2.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

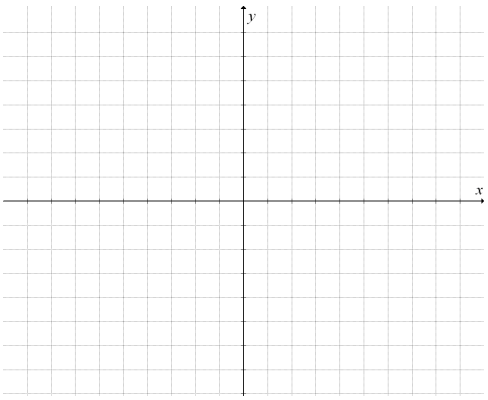
1. Find the slope of the line containing the given points:

   (a) $f(\frac{2}{3}) = 1$, $f(-2) = -\frac{7}{6}$

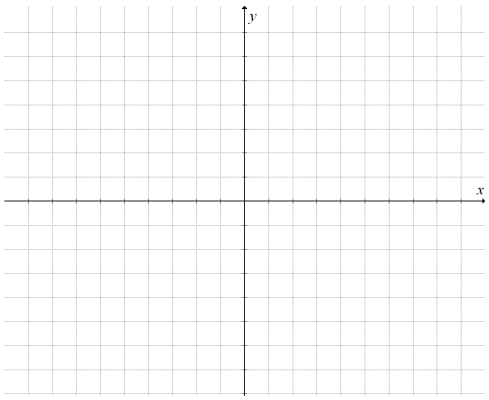
   (b) $(c, -d)$, $(-2c, d)$

2. Graph the linear equation and determine its slope and y-intercept.

   (a) $2x - 5y = 10$



   (b) $f(x) = -\frac{3}{4}x + 2$



3. Find the value of k so that the line containing the points $(-3, k)$ and $(4, 8)$ is perpendicular to the line containing the points $(5, 3)$ and $(1, -6)$.

4. Find the value of k, if the line $y + 2kx - 6 = 0$ is parallel to the line $y = -3 + x$.

5. Write a slope-intercept equation for the line with the given characteristics:

   (a) $m = -\frac{5}{6}$, passes through $(1, -1)$

   (b) Passes through $(2, 0)$ and $(0, -3)$

   (c) Passes through $(3, -5)$ and $(-2, -9)$

   (d) Parallel to $y = \frac{1}{4}x + 2$, and passes through $(11, 3)$

   (e) Perpendicular to the y-axis, and passes through $(-14, 3)$

   (f) Parallel to the y-axis, and passes through $(-14, 3)$

   (g) Perpendicular to $3x + 4y = 5$, and passes through $(-5, -1)$

   (h) $g(-2) = -1$, $g(3) = 4$

6. Determine whether the given pairs of lines are parallel, perpendicular, or neither:

   (a) $2x - 5y = -3$, $2x + 5y = 4$

   (b) $2x + 4y = 5$, $y = 2x - 1$

7. Water freezes at 0° Celsius and 32° Fahrenheit and it boils at 100°C and 212°F.

   (a) Find a linear function F that expresses temperature in the Fahrenheit scale in terms of degrees Celsius. Use this function to convert 20°C into Fahrenheit.

   (b) Find a linear function C that expresses temperature in the Celsius scale in terms of degrees Fahrenheit. Use this function to convert 95°F into Celsius.

   (c) Is there a temperature n such that $F(n) = C(n)$?

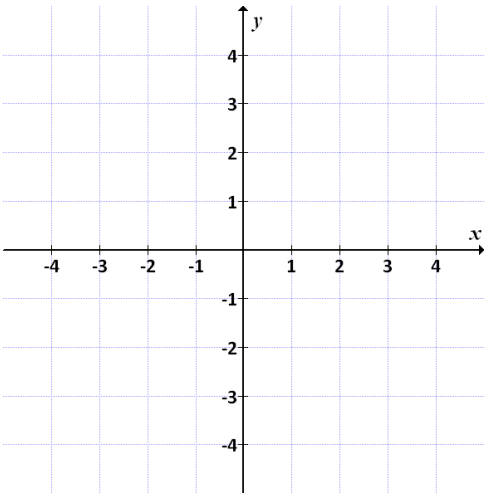
Math 1100 Name: .....

Lab Worksheet #17 (Section 2.3) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Find all the information for each function below, and sketch the graph on the axes provided.

(a) $f(x) = 5x^2 - 10x + 3$



Vertex Form: _____

Vertex: _____

Zeros: _____

x-intercept(s) (if any): _____

y-intercept (if any): _____

Domain: _____

Range: _____

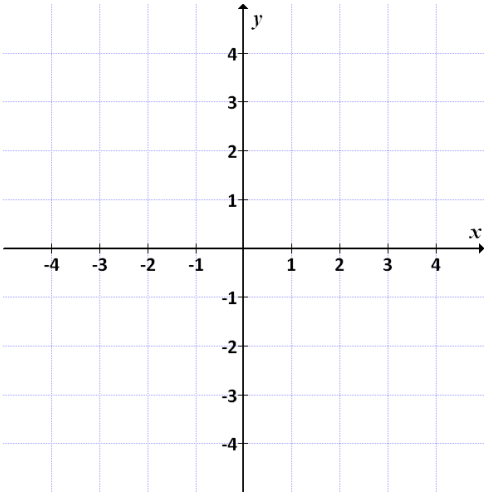
Increasing on: _____

Decreasing on: _____

Max/Min? _____

Axis of Symmetry: _____

(b) $g(x) = -\frac{x^2}{3} - 2x + 1$



Vertex Form: _____

Vertex: _____

Zeros: _____

x-intercept(s) (if any): _____

y-intercept (if any): _____

Domain: _____

Range: _____

Increasing on: _____

Decreasing on: _____

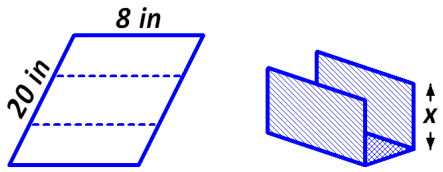
Max/Min? _____

Axis of Symmetry: _____

2. A homeowner wants to fence a rectangular play yard using 80 ft of fencing. The side of the house will be used as one side of the rectangle. Find the dimensions for which the area is a maximum.

3. A one compartment vertical file is to be constructed by bending the long side of an 8 in. by 20 in. sheet of plastic along two lines to form a U shape.

   (a) Find a function V that represents the volume of the file in terms of x.

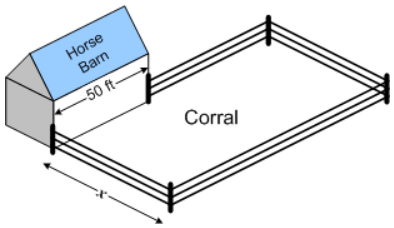


   (b) What is the domain of the function V?

   (c) How tall should the file be to maximize the volume that it can hold?

4. Find b such that $f(x) = -4x^2 + bx + 3$ has a maximum value of 50.

5. A horse breeder wants to construct a corral next to a horse barn that is 50 ft long, using the barn as part of one side of the corral (see the figure). If he has 250 feet of fencing available, find the maximum area which can be enclosed.



Math 1100 Name: .....

Lab Worksheet #18 (Section 2.4) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve. Write the solution set in interval notation.

   (a) $3x^2 \leq 8x + 3$

   (b) $4x^2 - 20x > -25$

2. Find the domain of the function $f(x) = \sqrt{9 - 4x^2}$. Write your answer using interval notation.

3. The profit, in dollars, made by selling x bottles of tonic is given by $P(x) = -x^2 + 25x - 100$, for $0 \leq x \leq 35$. How many bottles of tonic must be sold to make at least \$50 in profit?

4. Suppose $C(x) = x^2 - 10x + 27$, $x \geq 0$ represents the costs, in *hundreds* of dollars, to produce x *thousand* pens. Find the number of pens which can be produced for no more than \$1100.

Math 1100 Name: .....

Lab Worksheet #19 (Section 3.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. For each polynomial function, find the following information, and graph. Clearly label all intercepts.

   (a) $f(x) = x^4 - 4x^3 + 3x^2$

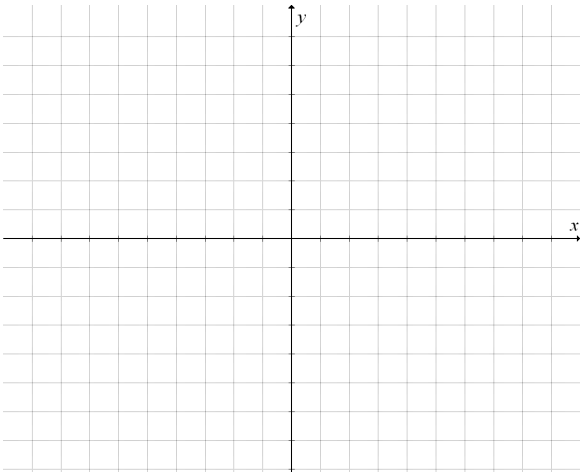
   End behavior:

   Real zeros and their multiplicity:

   Crosses or tangent to x-axis:

   Sign Diagram:

   y-intercept:



   (b) $g(x) = -\frac{1}{2}(x-2)^2(x+1)^2(x-1)$

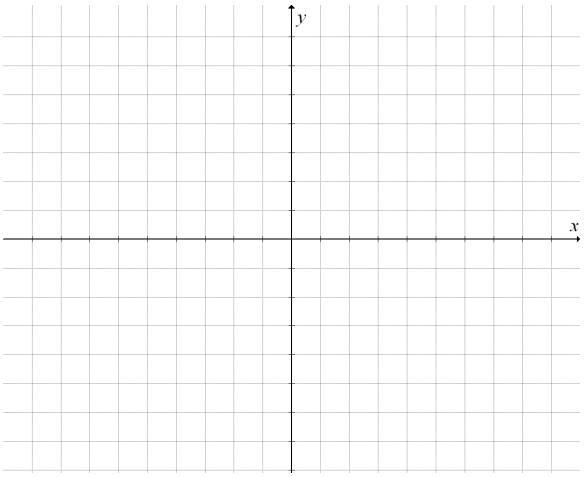
   End behavior:

   Real zeros and their multiplicity:

   Crosses or tangent to x-axis:

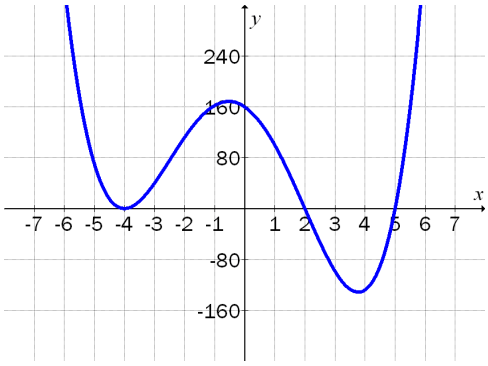
   Sign Diagram:

   y-intercept:

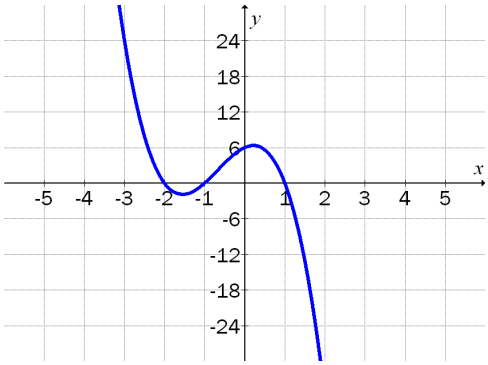


2. Determine the equation of the polynomial of minimum degree whose graph is shown.

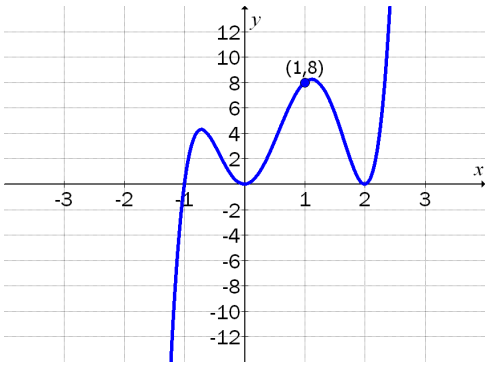
(a)



(b)



(c)



3. Solve. Write your answer in interval notation.

   (a) $2x^3 > 3x^2 + 2x$

   (b) $-2x(x-1)(x+3)^2 \leq 0$

Math 1100 Name: .....

Lab Worksheet #20 (Section 4.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

For each rational function below, find the domain, asymptotes (horizontal and vertical), holes, and x- and y-intercepts.

1. $f(x) = \dfrac{x^2 + 9}{2x^2 - 5x + 3}$

2. $g(x) = \dfrac{5x + x^2}{x^3 - 2x^2 - 4x + 8}$

3. $h(x) = \dfrac{3x - 1}{x}$

4. $k(x) = \dfrac{x^2 - 7x}{2x^2 - 9x - 35}$

Math 1100 Name: .....

Lab Worksheet #21 (Section 4.2) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Given $f(x) = \dfrac{4x+5}{2x}$, find the following: (use interval notation when appropriate)

   (a) Domain:

   (b) Vertical Asymptote(s):

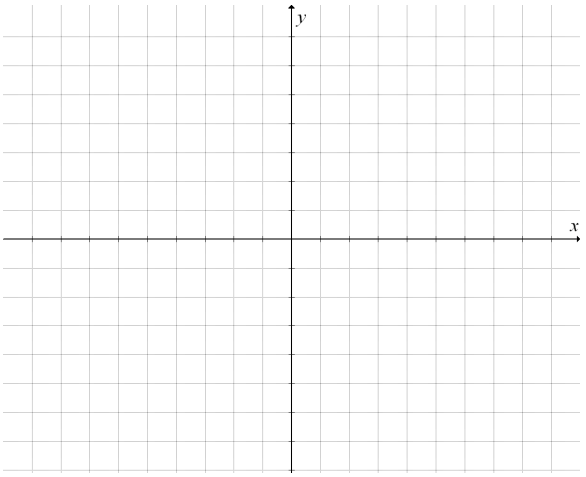
   (c) Horizontal Asymptote(s):

   (d) Hole(s):

   (e) x-intercept(s):

   (f) y-intercept:

   (g) Graph f on the axes given.



2. Given $g(x) = \dfrac{-4}{(x+2)^2}$, find the following: (use interval notation when appropriate)

   (a) Domain:

   (b) Vertical Asymptote(s):

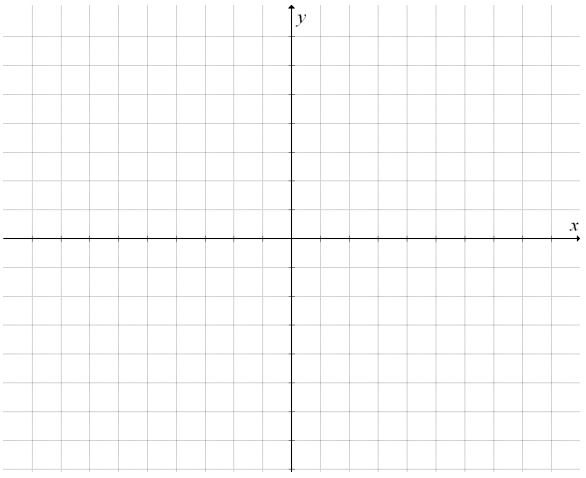
   (c) Horizontal Asymptote(s):

   (d) Hole(s):

   (e) x-intercept(s):

   (f) y-intercept:

   (g) Graph g on the axes given.



3. Given $h(x) = \dfrac{6x^2 + 17x + 11}{2x^2 - 2}$, find the following: (use interval notation when appropriate)

   (a) Domain:

   (b) Vertical Asymptote(s):

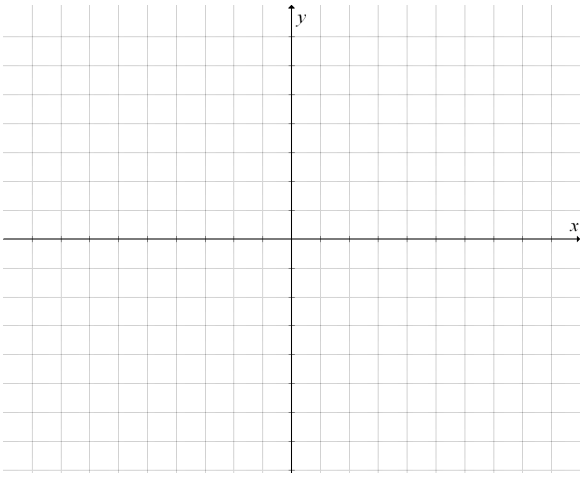
   (c) Horizontal Asymptote(s):

   (d) Hole(s):

   (e) x-intercept(s):

   (f) y-intercept:

   (g) Graph h on the axes given.



4. Find a rational function that satisfies the given conditions:

   (a) Vertical asymptotes: $x = 1, x = -2$, x-intercept: $(-5, 0)$

   (b) Vertical asymptote: $x = -3$, Horizontal asymptote: $y = 2$, x-intercept: $(1, 0)$

Math 1100 Name: .....

Lab Worksheet #22 (Section 4.3) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

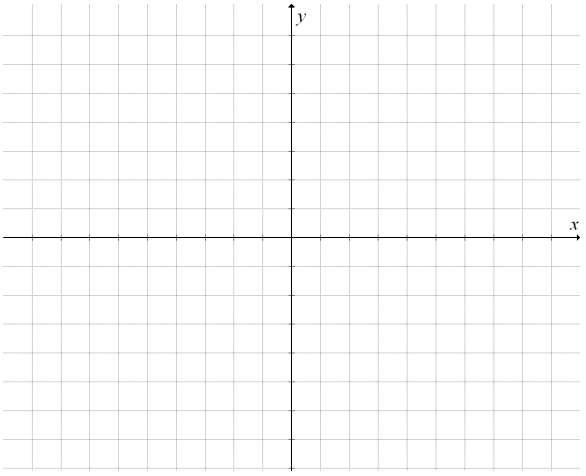
1. Sketch the graph of the function $f(x) = \dfrac{3x+8}{2x-4}$, and use it to solve each inequality below:

   (a) $f(x) \leq 0$

   (b) $f(x) < 0$

   (c) $f(x) \geq 0$

   (d) $f(x) > 0$



2. Solve. Write your answer in interval notation.

   (a) $\dfrac{x-2}{x+3} \leq 4$

(b) $\dfrac{5x}{7x-2} \geq \dfrac{x}{x+1}$

Math 1100 Name: .....

Lab Worksheet #23 (Section 5.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

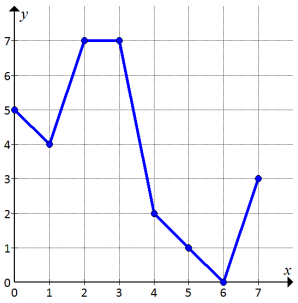
1. Given the two functions below, find:

$$f(x) = \begin{cases} |x+1| & \text{if} \quad x < 0 \\ x^2 - 3 & \text{if} \quad x \geq 0 \end{cases} \qquad g(x) = \begin{cases} \sqrt{4-x^2} & \text{if} \quad -2 \leq x < 2 \\ x^{-1} & \text{if} \quad x \geq 2 \end{cases}$$

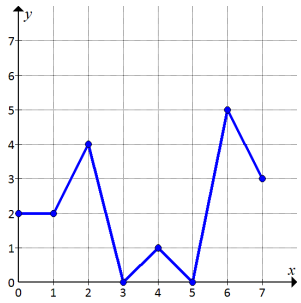
(a) $(f \circ g)(2)$

(b) $(g \circ f)(-2)$

2. Given the graphs of $y = f(x)$ and $y = g(x)$ below, find the function values.



$y = f(x)$



$y = g(x)$

(a) $(f \circ g)(1)$

(b) $(f \circ g)(3)$

(c) $(g \circ f)(2)$

(d) $(g \circ f)(0)$

(e) $(f \circ f)(5)$

(f) $(g \circ g)(6)$

3. Find functions $f(x)$ and $g(x)$ so that $(f \circ g)(x) = \dfrac{x^3 - 1}{x^3 + 1}$.

4. Consider the functions $f(x) = x^2 - 4$, $g(x) = \dfrac{1}{x-3}$, and $k(x) = \sqrt{x}$. Find the following (if it exists):

(a) $(k \circ f)(x)$

(b) The domain of $k \circ f$

(c) $(g \circ k)(x)$

(d) The domain of $g \circ k$

(e) $(g \circ g)(x)$

(f) The domain of $g \circ g$

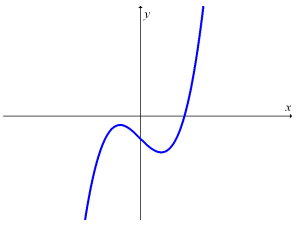
Math 1100 Name: .....

Lab Worksheet #24 (Section 5.2) Student ID: .....

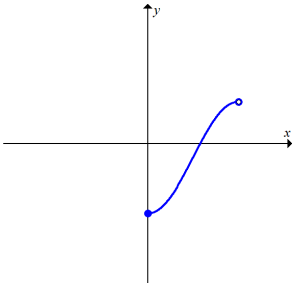
In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Using the horizontal line test, determine whether the function shown is one-to-one. If it is one-to-one, sketch the graph of its inverse on the same set of axes.

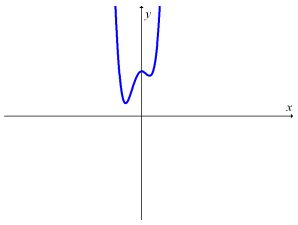
(a)



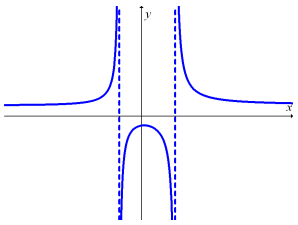
(b)



(c)

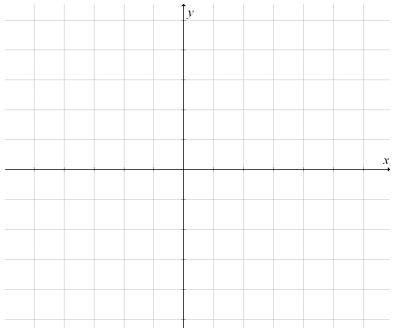


(d)

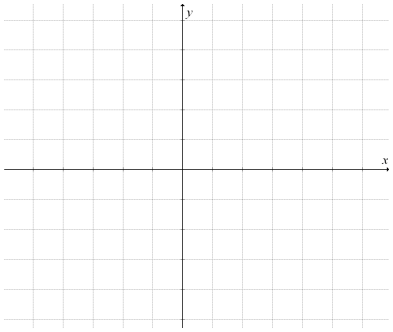


2. Graph the function and determine whether the function is one-to-one by using the horizontal line test. If it is one-to-one, find a formula for its inverse. Also, find the Domain and Range of both f and f^{-1}.

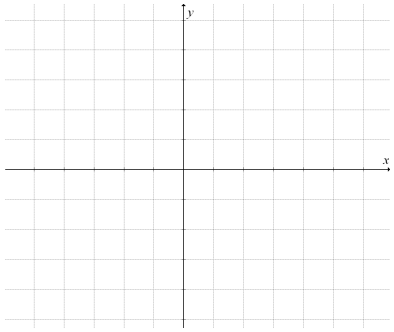
(a) $f(x) = 3 - |x|$



(b) $g(x) = \dfrac{5x+3}{2x-1}$



(c) $h(x) = \dfrac{(x-4)^3}{2} + 1$



3. For the function $f(x) = \dfrac{x+1}{x}$, use composition of functions to show that $f^{-1}(x) = \dfrac{1}{x-1}$.

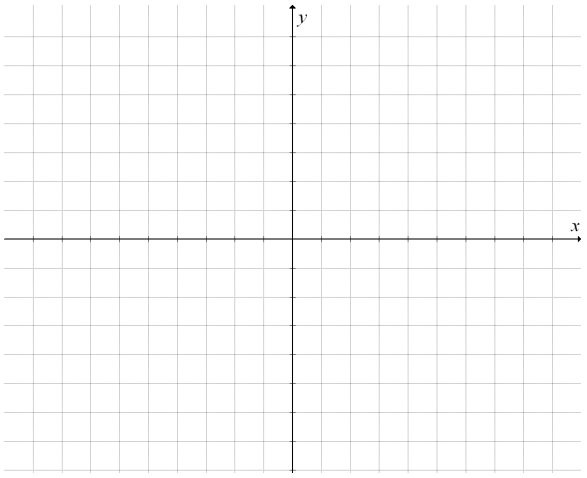
4. Given that $f(x)$ is a one-to-one function with domain $(-\infty, 5]$, and range $(3, \infty)$, complete the statements below:

   (a) If $f(1) = 7$, then $f^{-1}(\_\_\_\_\_) = \_\_\_\_\_$.

   (b) The range of f^{-1} is: _____.

   (c) $f(f^{-1}(289)) = \_\_\_\_\_$.

5. Find the inverse of the one-to-one function $f(x) = -\sqrt{x} + 2$, and sketch both f and f^{-1} on the axes below. State the domain and range of both f and f^{-1}.

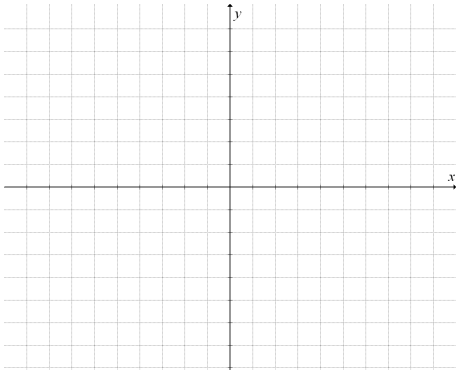
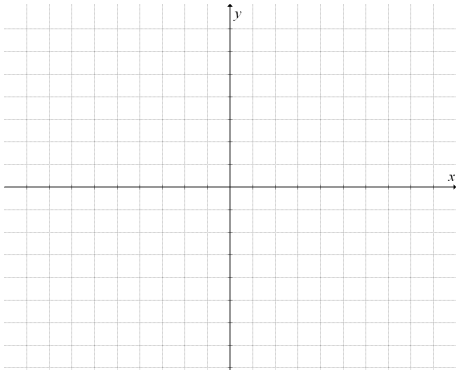


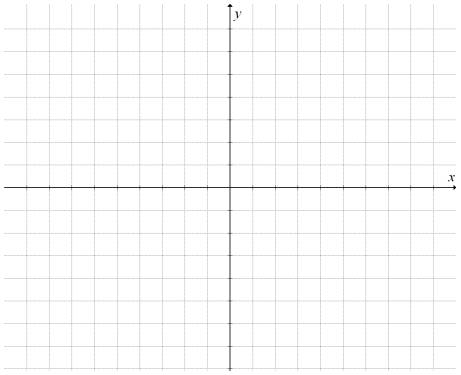
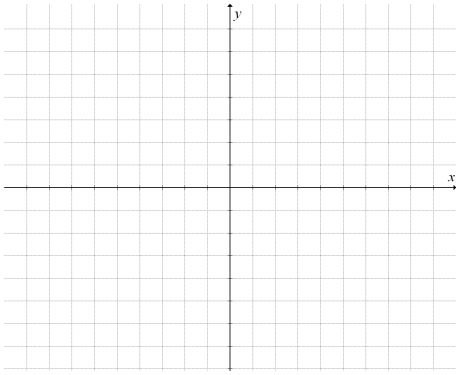
Math 1100 Name: .....

Lab Worksheet #25 (Section 6.1) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Complete the table below and graph each function.

Function:	(a) $f(x) = 2^{-x} + 3$	(b) $g(x) = -\left(\frac{1}{3}\right)^{x+1}$
Domain:		
Range:		
y-**intercept:**		
Asymptote:		
Graph:		

Function:	(c) $f(x) = \log_3(x + 9)$	(d) $g(x) = 1 - \log(x)$
Domain:		
Range:		
y-**intercept:**		
Asymptote:		
Graph:		

2. Complete the table below by converting each equation to its equivalent form.

	(a)	(b)	(c)	(d)
Exponential Form:	$e^{-t} = 36$		$10^{0.3010} = 2$	
Logarithmic Form:		$\log x^3 = 5$		$\ln x = \sqrt{p}$

3. Find each of the following without using a calculator.

(a) $\log_2 64$

(b) $\log \sqrt[5]{100}$

(c) $\ln \frac{1}{e} + \log 1$

(d) $2^{-\log_2(5)}$

(e) $\log_9(27)$

(f) $\log(e^{\ln(.01)})$

4. Find the domain of the function (using interval notation).

(a) $f(x) = \log(2 - 5x)$

(b) $f(x) = \log_2(x^2 - 4x)$

Math 1100 Name: .....

Lab Worksheet #26 (Section 6.2) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Express in terms of sums and differences of logarithms.

   (a) $\log \dfrac{100x}{y^3}$

   (b) $\log_b \sqrt[3]{\dfrac{a^4b^3}{ab^{-1}}}$

2. Express as a single logarithm and, if possible, simplify.

   (a) $3\log_b x - 4\log_b y + \frac{1}{2}\log_b z$

   (b) $\ln(x^2 - 5x - 14) - \ln(x^2 - 4)$

   (c) $\log_5(x+1) + \log_5(x-3) - 2$

   (d) $\log_3(x-1) - \log_{\frac{1}{3}}(x)$

3. Given that $\log_a 2 \approx 0.3$, $\log_a 7 \approx 0.8$, and $\log_a 11 \approx 1$, find approximations for each of the following, if possible.

   (a) $\log_a \frac{2}{11}$

   (b) $\log_a 14$

   (c) $\log_a 9$

   (d) $\log_{11} 7$

4. True or False. Assume all variables are positive, with $a, b \neq 0, 1$. Justify your answer.

   (a) $\log_b \dfrac{x}{y} = \dfrac{\log_b x}{\log_b y}$

   (b) $\dfrac{\log_b x}{\log_b y} = \log_b x - \log_b y$

   (c) $\log_b \dfrac{x}{y} = \log_b x - \log_b y$

   (d) $\log_b x \cdot \log_b y = \log_b x + \log_b y$

   (e) $\log_b(x \cdot y) = \log_b x \cdot \log_b y$

   (f) $\log_b(x \cdot y) = \log_b x + \log_b y$

   (g) $\log_b(x^r) = (\log_b x)^r$

   (h) $\log_b(x^r) = r \cdot \log_b x$

   (i) $(\log_b x)^r = r \cdot \log_b x$

   (j) $\log_b b = 0$

   (k) $\log_b 1 = b$

   (l) $\log_b b = b$

   (m) $\log_b x = \dfrac{\log_a x}{\log_b a}$

   (n) $\log_2 x = \dfrac{\log x}{\log 2}$

   (o) $3^{\log_3 x} = x$

   (p) $\log_a(a^x) = x(\log_a a)^x$

   (q) $\log_b \dfrac{1}{x} = -\log_b x$

   (r) $\log_b a = \dfrac{1}{\log_a b}$

Math 1100 Name: .....

Lab Worksheet #27 (Section 6.3) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve the exponential equation.

(a) $3^{x^2+4x} = \frac{1}{27}$

(b) $4^{3x+1} = \frac{1}{8^{x-1}}$

(c) $3^{x-1} = 2^{2x+1}$

(d) $e^{2x} + 3e^x = 4$

(e) $50 = 20 + 4e^{-x/10}$

(f) $10 = \frac{200}{1 + 2e^{-0.2x}}$

2. For each one-to-one function below, find (i) the x- and y-intercepts, and (ii) its inverse function.

   (a) $f(x) = 5 - 3^{2x}$

   (b) $g(x) = 3e^{5x-1} + 4$

3. Solve: $e^x - 6e^{-x} = 1$

Math 1100 Name: .....

Lab Worksheet #28 (Section 6.4) Student ID: .....

In order to receive full credit, SHOW ALL YOUR WORK. Enclose your final answers in boxes.

1. Solve the logarithmic equation.

(a) $\log_3(x-5) = 2$

(b) $3 - \log_2(3x^2 + 2x) = 0$

(c) $\log_3(x-8) = 2 - \log_3 x$

(d) $\log_5(1-x) = \log_5 \frac{2}{3} + \log_5(x-4)$

(e) $\log_2(x) = 2 - \log_4(x)$

(f) $(\log x)^2 - \log x^2 = 3$

2. For each one-to-one function below, find (i) the x- and y-intercepts, and (ii) its inverse function.

   (a) $h(x) = 1 + \log_3(9 - 2x)$

   (b) $k(x) = 3\ln(3x - 2) - 5$