PRECALCULUS SUMMER HOMEWORK

This packet will be checked on the first day of the semester for completeness. There will be no late work accepted for credit. A quiz covering this material will be given within the first week of class.

Please do all work on separate paper, and show any work necessary

Section P.1

For problems 1 – 6, multiply the given expressions.

1) $x(x+1) =$

2) $(x+4)(x-5) =$

3) $(x^2+1)(x-3) =$

4) $x^3(x+1)(x-4) =$

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

6) $(2x-1)(x^2+4x-2) =$

For problems 7 – 12, factor the given expressions.

7) $x^2+3x =$

8) $-4x^2-18x =$

9) $x^2+5x+6 =$

10) $x^2-x-56 =$

11) $x^2-7x+12 =$

12) $2x^2-x-6 =$

For problems 13 – 20, find a common denominator before adding and subtracting the given fractions. Do not use a calculator.

13) $\frac{3}{4}-\frac{1}{2} =$

14) $\frac{2}{5}+\frac{1}{7} =$

15) $\frac{5}{8}-\frac{1}{3} =$

16) $\frac{7}{12}+\frac{1}{8} =$

17) $\frac{1}{x}-\frac{1}{y} =$

18) $\frac{3}{x+1}+\frac{2}{x-1} =$

19) $\frac{3}{x}-\frac{4x}{x+2} =$

20) $\frac{x+1}{x+3}+\frac{x-2}{x-1} =$

For problems 21 – 26, multiply or divide the given fractions and then simplify your answer.

21) $\frac{x}{x+1}\cdot\frac{3}{2x} =$

22) $\frac{-3x^2}{x-2}\cdot\frac{x-2}{6x} =$

23) $\frac{x^2-9}{x+3}\cdot\frac{1}{x-3} =$

24) $\frac{x-3}{x^2-x-6}\div\frac{3x-9}{x+2} =$

25) $\frac{2x^2+4x+2}{x-1}\div\frac{2}{x^2-1} =$

26) $\frac{\frac{x}{1+x}}{x} =$

27) Mr. Koehrer and Mr. Coulson decide to go see MacGruber. Together they paid $26 for two tickets and two sodas. If a ticket costs $5 more than a soda, how much does a ticket cost?

28) Mrs. Hopkins, Ms. Robson, and Ms. Holtmeyer are going to a Cardinal's game. For their three tickets, nine hot dogs, and nine sodas, they paid a total of $177. If a hot dog and soda cost $13, and a soda is $3 more than a hot dog, how much does each item cost?

29) Thomas spent his three day weekend selling lemonade on the streets. He spent $30 on signs, a chair, and a table for his stand. If he sold each cup of lemonade for $.25, but it cost $.09 total for the cup, ice, lemons, and sugar, how many cups of lemonade would Thomas have to sell to break even?

30) Mr. Coulson has $5000 to invest. He splits the money into an IRA and a 403b, which have a return of 3% and 6% respectively. If he earns $240 total after one year, how much did Mr. Coulson invest into each account?

31) Mr. Coulson bought Sour Gummy Worms, Skittles, and Mounds bars for the winners of his Jeopardy games. He remembers buying twelve pieces of candy total and spending $10. He also knows the Gummy Worms cost $2, the Skittles cost $1, and the Mounds Bars cost $.50. If he bought four times as many Mounds bars as bags of Skittles, how many bags of Sour Gummy Worms did he buy?

32) A small business owner invests $11,000 to produce a new product. Each unit costs $.56 to make and is sold for $1.72. How many units must be sold for the business to break even?

33) You are offered two jobs selling jalopies. One company offers a yearly salary of $22,500 plus a year-end bonus of 1.5% of your total jalopy sales. The other job pays $22,000 a year with a bonus of 2% of your total sales. How much would you need to sell in a year to make the second job a better offer?

Section 1.1

For problems 1 – 4, sketch the line that passes through the given point that has the given slope.

1) $(2, 3)$ *and* $m = 0$

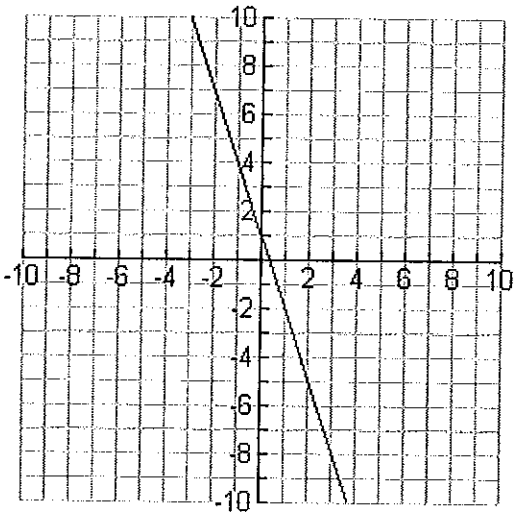
2) $(-4, 1)$ *and* $m = 2$

3) $(-3, 7)$ *and m is undefined*

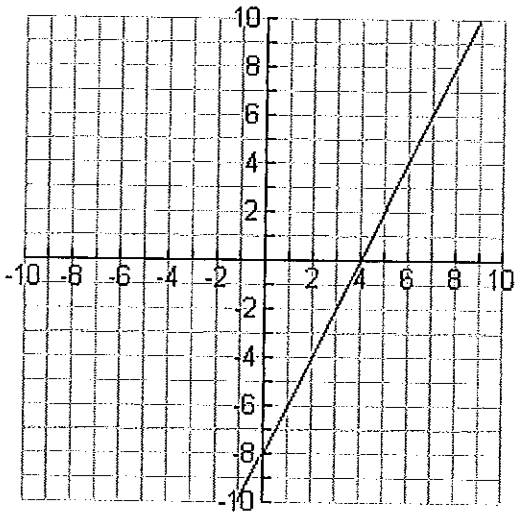
4) $(0, -1)$ *and* $m = \frac{1}{2}$

For problems 5 and 6, estimate the slope of the line.

5)



6)



For problems 7 – 10, find the equation of the line with the given point and slope. Then sketch the graph by hand.

7) $(-3, 6)$ *and* $m = -2$

8) $(0, 0)$ *and* $m = \frac{3}{4}$

9) $(-10, 4)$ *and* m *is undefined*

10) $(2.3, -8.5)$ *and* $m = 0$

For problems 11 and 12, find the slope – intercept form of the equation of the line that passes through the given points.

11) $(4, 3)$ *and* $(-4, -4)$

12) $(-1, 4)$ *and* $(6, 4)$

For problems 13 and 14, write the slope – intercept forms of the equations of the lines that travel through the given point that are a) parallel to the given line and b) perpendicular to it.

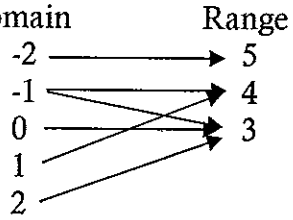
13) $(-3, 2)$ $x + y = 7$

14) $(-4, 1)$ $y + 2 = 0$

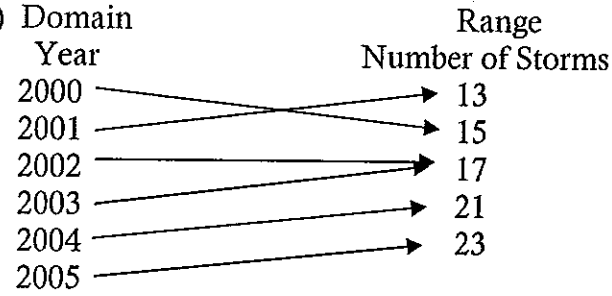
Section 1.2

For problems 1 – 5, determine whether the relationship describes a function or not. Explain your reasoning. (Hint: remember the definition of a function)

1)



2)



3)

Input Value	0	1	2	1	0
Output Value	-4	-2	0	2	4

4)

Input Value	0	3	6	9	12
Output Value	3	3	3	3	3

5) Domain = {a, b, c} and Range = {0, 1, 2, 3}

Ordered Pairs = (a, 1), (c, 2), (c, 3), (b, 3)

For problems 6 – 11, determine whether the equation represents y as a function of x.

6) $x = y^2$

7) $y = \sqrt{x + 5}$

8) $x = -y + 5$

9) $x + y^2 = 3$

10) $|y| = 4 - x$

11) $y = 8$

For problems 12 – 14, evaluate the given functions at the specified values of x.

12) $g(x)=7-3x$ a) $g(0)=$ b) $g\left(\frac{7}{3}\right)=$ c) $g(s+2)=$

13) $V(r)=\frac{4}{3}\pi r^3$ a) $V(3)=$ b) $V\left(\frac{3}{2}\right)=$ c) $V(2r)=$

14) $f(x)=\sqrt{x+8}+2$ a) $f(-8)=$ b) $f(1)=$ c) $f(x-8)=$

For problems 15 and 16, find the value of x that makes the f(x) = 0.

15) $f(x)=\frac{3x-4}{5}$

16) $f(x)=\frac{12-x^2}{5}$

For problem 17, find the values of x such that f(x) = g(x).

17) $f(x)=x^2+2x+1$
$g(x)=3x+3$

For problems 18 – 20, find the <u>domain</u> of the given functions.

18) $f(x)=1-2x^2$

19) $f(x)=\frac{3x}{x-5}$

20) $f(x)=\sqrt[4]{x^2+3x}$

21) A company produces a toy for which the variable cost is \$12.30 per unit with a fixed cost of \$98,000. The toy sells for \$17.98. Let x be the number of units produced and sold.

a) The total cost for a business is the sum of the variable cost and the fixed cost. Write the total cost, C, as a function of x.

b) Write the revenue, R, as a function of x.

c) Write the profit, P, as a function of x. (HINT: Profit = Revenue – Cost)

<u>Section 1.3</u>

For problems 1 – 3, find the domain and range of the given functions.

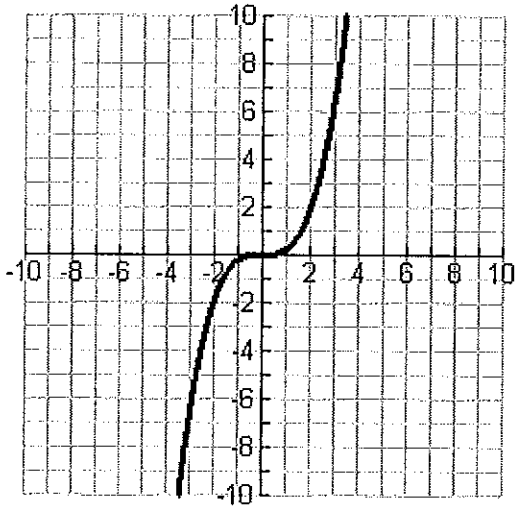
1) $f(x)=-x^2-1$

2) $f(x)=\sqrt{4-x^2}$

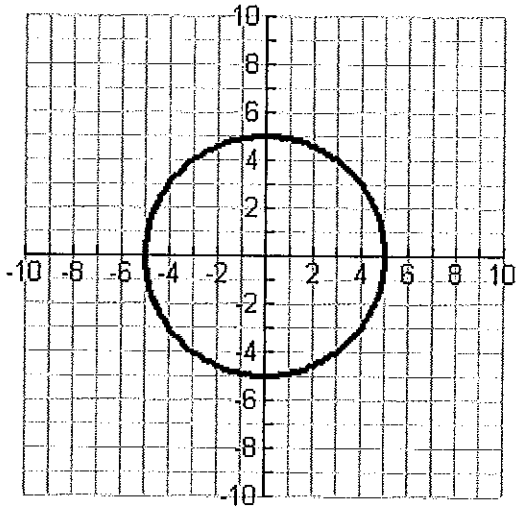
3) $f(x)=-\frac{1}{4}|x-5|$

For problems 4-6, determine whether the graph represents a function by using the vertical line test.

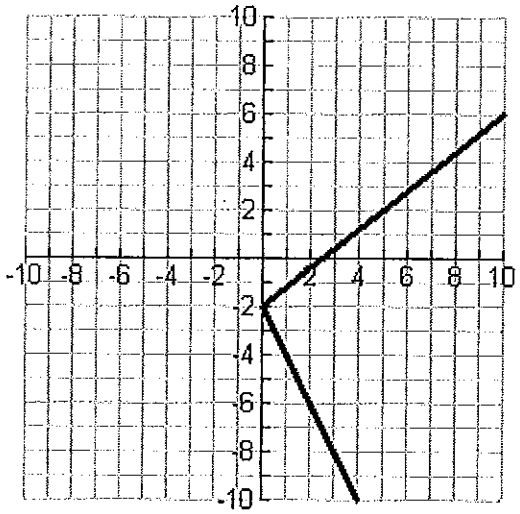
4)



5)



6)



For problems 7 and 8, use the maximum and minimum functions of a graphing calculator to find the relative maximums and minimums of the given functions. Round to the nearest hundredth.

7) $f(x)=3x^2-2x-5$

8) $f(x)=x^3-6x^2+15$

For problems 9 and 10, sketch the graph of the piece-wise function by hand.

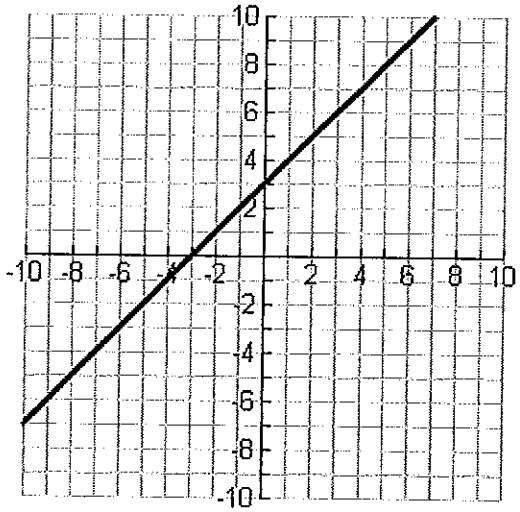
9) $f(x)=\begin{cases} x+6 & x\le -4 \\ 2x-4 & x>-4 \end{cases}$

10) $f(x)=\begin{cases} 3+x & x<0 \\ x^2+1 & x\ge 0 \end{cases}$

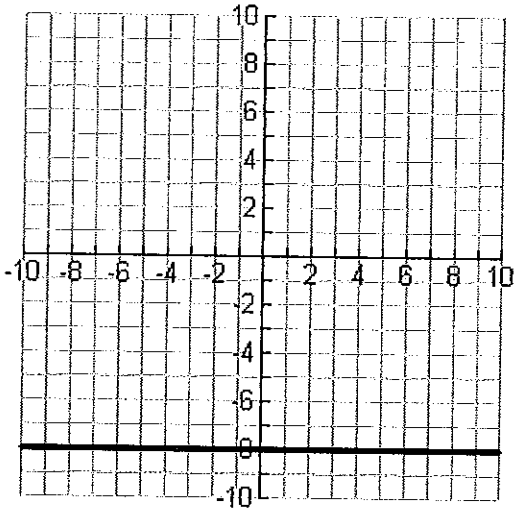
Section 1.4

For problems 1 – 6, identify the parent function and describe the transformation(s) shown in the graph. Write an equation for the graphed function. (HINT: we're talking about a, h, and k here)

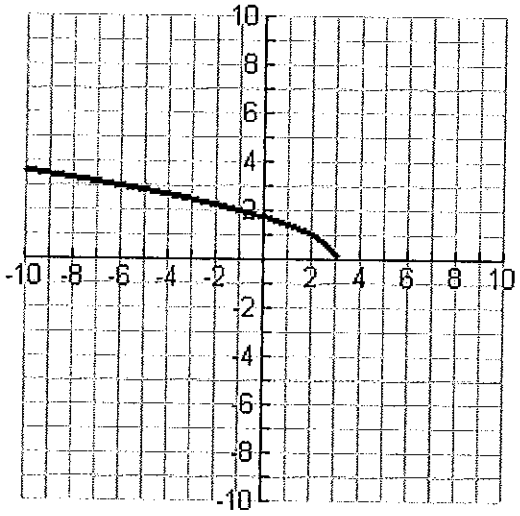
1)



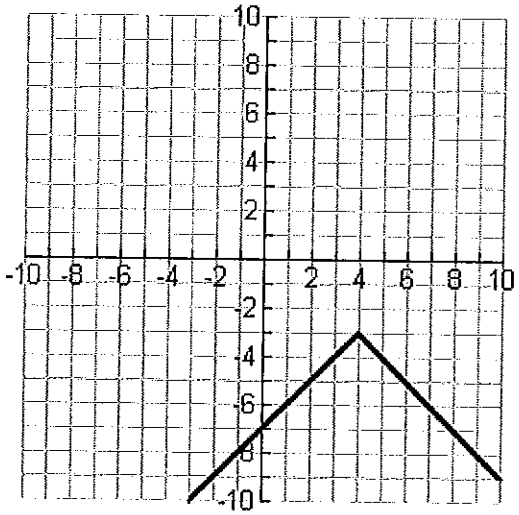
2)



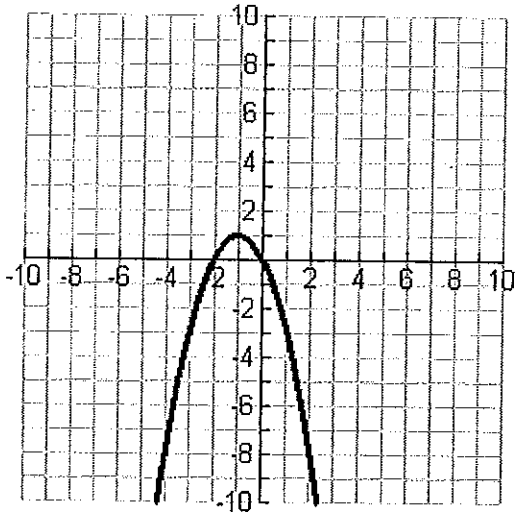
3)



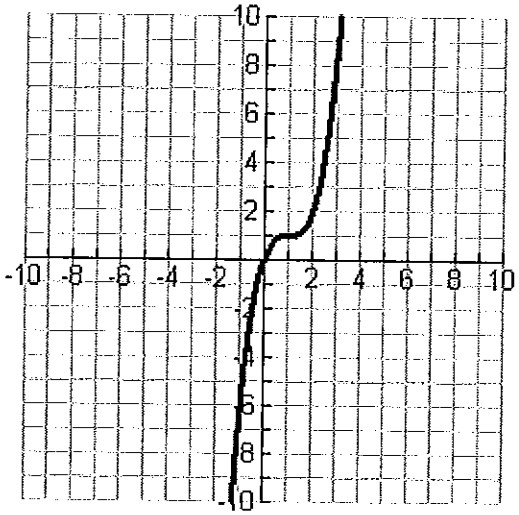
4)



5)



6)



For problems 7 – 11, *g* is related to one of the six parent functions. (a) Identify the parent function. (b) describe the transformation(s) that are occurring (again, we're talking a, h, and k). (c) Sketch the graph by hand.

7) $g(x) = -(x+10)^2 + 5$

8) $g(x) = -\frac{1}{4}(x+2)^2 - 2$

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

10) $g(x) = -(x+3)^3 - 10$

11) $g(x) = |x+3| + 9$

Section 1.5

For problems 1 – 4, find (a) *(f + g)(x)*, (b) *(f - g)(x)*, (c) *(fg)(x)*, and (d) *(f/g)(x)*. What is the domain of *f/g*?

1) $f(x) = 2x - 5,\ \ g(x) = 1 - x$

2) $f(x) = 2x - 5,\ \ g(x) = 4$

3) $f(x) = \sqrt{x^2 - 4},\ \ g(x) = \frac{x^2}{x^2 + 1}$

4) $f(x) = \frac{x}{x+1},\ \ g(x) = x^3$

For problems 5 – 8, evaluate the indicated function for $f(x) = x^2 + 1$ and $g(x) = x - 4$ algebraically.

5) $(f - g)(-2)$

6) $(f + g)(1)$

7) $(fg)(-6)$

8) $\left(\frac{f}{g}\right)(0)$

For problems 9 and 10, find (a) $f \circ g$, (b) $g \circ f$, and if possible, (c) $(f \circ g)(0)$ (HINT: $f \circ g = f(g(x))$ *and* $g \circ f = g(f(x))$).

9) $f(x) = \sqrt[3]{x-1},\ \ g(x) = x^3 + 1$

10) $f(x) = x^3,\ \ g(x) = \frac{1}{x}$

For problems 11-13, determine the domains of (a) *f*, (b) *g*, and (c) $f \circ g$.

11) $f(x) = \sqrt{x+3},\ \ g(x) = \frac{x}{2}$

12) $f(x) = x^{1/4},\ \ g(x) = x^4$

13) $f(x) = \frac{1}{x},\ \ g(x) = \frac{1}{2x}$

Section 1.6

For problems 1-3, show algebraically that f and g are inverse functions (HINT: $f(g(x)) = g(f(x)) = x$)

1) $f(x) = \frac{1}{x}, \quad g(x) = \frac{1}{x}$

2) $f(x) = 9 - x^2, \quad x \geq 0; \quad g(x) = \sqrt{9 - x}$

3) $f(x) = \frac{1}{1+x}, \quad x \geq 0; \quad g(x) = \frac{1-x}{x}, \quad 0 < x \leq 1$

For problems 4 – 9, use the Horizontal Line Test to determine whether the function is one-to-one and has an inverse function.

4) $f(x) = \frac{1}{4}(x+2)^2 - 1$

5) $g(x) = \frac{4-x}{6x^2}$

6) $f(x) = -2x\sqrt{16 - x^2}$

8) $f(x) = -0.65$

9) $f(x) = x^5 - 7$

Section 1.7

For problems 1 – 8, perform the indicated operations using the following matrices.

$$A = \begin{bmatrix} 1 & -2 \\ 4 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 5 \\ -1 & 0 \end{bmatrix}, \quad C = \begin{bmatrix} -6 & 8 \\ 10 & 15 \end{bmatrix}, \quad D = \begin{bmatrix} -1 & 3 & -2 \\ 2 & 0 & -1 \end{bmatrix}, \quad E = \begin{bmatrix} 4 & -1 & 3 \\ 6 & -2 & 1 \end{bmatrix}$$

1) 2A + B

2) C – 3B

3) A – 2D

4) 4D + E

5) AC

6) DE

7) (A + B)D

8) A(C – B)

For problems 9 – 12, use an inverse matrix to solve the linear system.

9) $\begin{aligned} 3x + 4y &= 6 \\ 4x + 5y &= 7 \end{aligned}$

10) $\begin{aligned} 2x - 7y &= -36 \\ x - 3y &= -16 \end{aligned}$

11) $\begin{aligned} 5x + 3y &= -5 \\ -9x - 6y &= 12 \end{aligned}$

12) $\begin{aligned} 3x + 2y &= 15 \\ -x + 4y &= -33 \end{aligned}$

13) A total of $15,000 is invested in two corporate bonds that pay 5% and 7% simple annual interest. The investor wants to earn $880 in interest per year from the bonds. How many should be invested in each bond?

14) For the opening day of a carnival, 800 admission tickets were sold. The receipts totaled $3775. Tickets for children cost $3 each, tickets for adults cost $8 each, and tickets for senior citizens cost $5 each. There were twice as many children's tickets sold as adult tickets. How many of each type of ticket were sold?