Pre-Calculus
Review – 1st Semester Exam

Name:
Period:

- *The final exam covers Ch. P, 1, 2, 7, 3, 9 and will account for 15% of your semester grade.*
- *Questions marked with ** are calculator OK.*

Chapter P

(#1-2) Solve the inequality and draw a number line graph of the solution set.

1. $-1 \le 3x - 2 < 7$

2. $4(1-x)+5(1+x) > 3x-1$

(#3-4) Write an equation that fits the line described below in slope-intercept form.

3. The line through the points (-4,5) and (4,3)

4. The line through the points (4,2) and (-3,1)

(#5-8) Solve using the method indicated.

5. Quadratic formula: $2x^2 - 3x + 1 = 0$

6. Factoring: $x^2 - x - 20 = 0$

7. Graphically: $4x^2 - 8x + 3 = 0$ **

8. Identify the domain of: $f(x) = \dfrac{x-2}{\sqrt{x+5}}$

(#9-13) Solve algebraically and express your answer in interval notation:

9. $|x+4| \ge 5$

10. $|x-3| < 2$

11. $|4-3x|-2 < 4$

12. $x^3 - x \ge 0$

13. $\dfrac{x+2}{2x-3} \ge 0$

Chapter 1

1. Use your calculator to find all local maxima and minima and the values of x where they occur. Round values to 2 decimals places. $h(x) = -x^3 + 2x - 3$ **

2. Graph the function and identify intervals on which the function is increasing, decreasing, or constant. Remember, your intervals are based on the "x" values. $f(x) = x^3 - x^2 - 2x$ **

3. State whether the function is odd, even, or neither. Support graphically. $f(x) = 2x^4$ **

4. State whether the function is odd, even, or neither. Support graphically. $y = 2x^3 - 3x$ **

5. Use a method of your choice to find all horizontal and vertical asymptotes. (You should be able to do it both graphically and algebraically.) $g(x) = \frac{x+2}{3-x}$ and $f(x) = \frac{x^2+2}{x^2-1}$

6. Find $(f \circ g)(3)$ *and* $(g \circ f)(-2)$ if $f(x) = 2x - 3$ *and* $g(x) = x + 1$

7. Find $f(g(x))$ *and* $g(f(x))$ if $f(x) = 3x + 2$ *and* $g(x) = x - 1$

8. List, in order, the transformations applied to $y = x^2$ to obtain the graph of $y = (x-1)^2 + 3$.

(#9-10) Describe a basic graph (original) and a sequence of transformations that can be used to produce a graph of the given function.

9. $y = 2(x-3)^2 - 4$

10. $y = (3x)^2 - 4$

(#11-12) write the equation of the new function based on the given transformations applied to the given function.

11. $y = x^2$; Vertical stretch by a factor of 3; shift right 4 units.

12. $y = |x|$; shift left 2 units; vertical stretch by factor of 2; shift down 4 units

(#13-14) Find the domain and range of the function. You should be able to do so algebraically and graphically.

13. $h(x) = (x-2)^2 + 5$

14. $k(x) = \sqrt{4-x^2} - 2$

15. Find all discontinuities for the function: $f(x) = \dfrac{5x-25}{x^2-5x}$. Then, graph the function and describe the behavior around the vertical asymptote.

16. State all intervals on which the function is ***increasing***. (Remember, the intervals are based off the "x" values of the ordered pairs.) $y = \dfrac{x^2-1}{x^2-4}$ **

(#17-18) Find the equation for $f^{-1}(x)$.

17. $f(x) = 2x + 3$

18. $f(x) = \sqrt[3]{x-8}$

(#19-20) Let $f(x) = \sqrt{x}$ and $g(x) = x^2 - 4$.

19. Find an expression for $(f \circ g)(x)$ and give its domain.

20. Find an expression for $(g \circ f)(x)$ and give its domain.

21. Describe the end behavior of the function *f(x) = x* using limit notation.

****Be sure to review the 11 basic functions and their properties (even, odd, inc., dec., domain, range, etc.).****

Chapter 2

1. Sketch a graph of the function by hand. $f(x) = x^2 - 4x + 6$

2. Describe the end behavior of the following graphs. (Use correct limit notation)
   a. $f(x) = 3x^4 - 5x^2 + 3$
   b. $f(x) = -x^3 + 7x^2 - 4x + 3$

3. Divide f(x) by d(x).
   $f(x) = x^3 + 4x^2 + 7x - 9;\ d(x) = x + 3$

4. Divide using synthetic division.
   $\dfrac{x^3 - 5x^2 + 3x - 2}{x + 1}$

5. Use the remainder theorem to find the remainder when $f(x) = 2x^2 - 3x + 1$ is divided by $x - 2$.

6. Use the remainder theorem to find the remainder when $f(x) = 2x^3 - 3x^2 + 4x - 7$ is divided by $x - 2$.

7. Write a polynomial in FACTORED form with a degree of 4 with zeros at -1, 3 and 1-2i.

8. Use the factor theorem to determine whether x -1 is a factor of $x^3 - x^2 + x - 1$.

9. Use the factor theorem to determine whether x - 2 is a factor of $x^3 + 3x - 4$.

10. Factor the following polynomial: $f(x) = 2x^4 + 7x^3 - 7x^2 - 35x - 15$ **

11. Find all zeros – both real and imaginary – of the following polynomial: $f(x) = x^4 - 2x^3 + x^2 - 8x - 12$ **

12. See textbook page 215#17, 19 (Section 2.5 – matching polynomial graphs)

13. Find the asymptotes and intercepts of the function. $f(x)=\dfrac{2}{x-3}$

14. Find the asymptotes and intercepts of the function. $f(x)=\dfrac{x-2}{x^2-2x-3}$

15. Find the asymptotes and intercepts of the function. $f(x)=\dfrac{2x^2+x-2}{x^2-1}$

16. Find the asymptotes and intercepts of the function. $f(x)=\dfrac{x^2-2x+3}{x+2}$

17. Solve the equation *algebraically*. Check for extraneous solutions! $\dfrac{3x}{x+5}+\dfrac{1}{x-2}=\dfrac{7}{x^2+3x-10}$

18. Determine the values of x that cause the polynomial function to be a) zero, b) positive, and c) negative
$f(x)=(x+2)(x+1)(x-5)$

19. Complete a sign chart and solve the polynomial. Express your answer in interval notation.
$(x+1)(x-3)^2>0$

20. Solve the polynomial $x^3-x^2-2x\geq 0$ graphically. Express your answer in interval notation. **

21. Solve the inequality using a sign chart. Support your answer graphically. Express your answer in interval notation. $\dfrac{x-1}{x^2-4}<0$

22. Designing a cardboard box. See textbook page 195 #67. **

Chapter 7 (Matrices)

1. Use the matrices A, B, C, and D to find the following:

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

a. $2A - 3B$

b. $C \times B$

c. $A \times C$

d. $D \times C$

e. B^{-1}

f. The determinant of A

2. Solve the system using the indicated method: $2x - 3y + z = 14$ **
$3x - 4y + 6z = 29$
$x + 2y - 5z = -11$

a. Inverse Matrices

b. Reduced Row Echelon Form

Chapter 3.1-3.5 (Exponentials, Logarithms, and Logistics)

1. Find the equation of an exponential that goes through the points (0,3) and (2, 12).

2. The population of a town is decreasing at a rate of 1.5% per year. The initial population was 2000 people. When will the population reach 1000 if the population continues to decay at this rate? **

3. Write the equation of a logistic function that has an initial value of 16, limit to growth of 128, and passes through the point (5,32). **

(#4-6) Solve the log expression.

4. $\log_4 \frac{1}{16}$

5. $\ln e^{-5}$

6. $\log_2 64$

(#7-9) Solve the equation for x.

7. $4\log x = 8$

8. $\ln(x-3) + \ln(x+4) = 3\ln 2$

9. $\log_3 3x + \log_3 x = 4$

10. Solve the equation for x: $4000 + 200(2.08)^x = 6000$ **

11. Graph the following logarithmic function: $f(x) = \log_2 x$

Chapter 9 (Combinatorics, Permutations and Probability)

1. At a Wendy's restaurant a customer can order a single, double or triple hamburger with up to 12 condiments (ketchup, mustard, onions, pickles, etc.). How many different ways can the customer order a burger?**

2. Write the sample space for all outcomes of flipping 3 different coins.

3. How many distinguishable 9 letter "words" can be formed using the letters in TENNESSEE?**

4. How many ways can 9 starters be chosen from a team of 20 baseball players if each has equal abilities?**

5. 17 baseball players show up to a game. How many ways can the manager write out a batting order of 9 batters?**

6. In your class there are 9 girls and 11 boys. Your teacher will be selecting a group of 7 students to compete in a mathematics contest.

   a. In how many ways can she select the group of 7? **

   b. How many ways can she select a group with exactly 5 boys? **

   c. How many ways can she select no more than 2 girls? **

7. Assume that the probability of giving birth to a boy or a girl is the same. **
   a. In a family of 3 children, what is the probability of:
      i. Having only one girl?
      ii. Having either all boys or all girls?

   b. In a family of 4 children, what is the probability of:
      i. Having three girls and one boy?
      ii. Having at least three girls?
      iii. Having 2 of each?

8. The probability of a colored gum ball coming out of a machine is shown in the table below.**

RED	WHITE	BLUE	GREEN	YELLOW
0.25	0.33	0.18	0.16	0.08

If one gumball is purchased, find each probability:
a. P(White) b. P(Blue or Green) c. P(Not Yellow)

If two gumballs are purchased, find each probability:
a. P(both Red) b. P(Green then Yel.) c. P(Blue and Green) d. P(No White)