**S1 Final Exam Review** Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Pre-Calculus*

**CHAPTER 1 - Fundamentals**

***Express the interval in terms of inequalities.***

1. (2, 8] 2. (5, ) 3. (-, 5]

***Express the inequality in interval notation.***

4. x < 5 5. -4 < x  6 6. x  -4

***Express each set in interval notation.***

7. 8.

 -1 5 0 4

***Simplify the expression.***

9. 10. 11. 

12. 13. 14. 

15. (4x – 3y)(2x + 5y) 16. (2x + 1)(3x – 2) – 5(4x – 1)

***Factor the expression.***

17.  18.  19. 

20.  21.  22. 

23. 24. 25.

26. 27. 28.

29.

***Simplify the expression.***

30.  31. 32.

33. 34. 35. 

36.  37.

***Solve the equation.***

38.  39. 

40. 41.

42.  43.

**CHAPTER 2 - Functions**

***Use the function to evaluate the following.***

1. f(-2) 2. f(x – 2) 3. f(a + h) 4.

***Evaluate f(0), f(3), and f(-4) for each function.***

5. f(x) = 3x + x 6. f(x) = x +  7. f(x) = 

***Sketch the graph of the function.***

8.  9. f(x) = 

10. The graph of a function g is given.

 a) Find g(-3), g(0), and g(4)

 b) Identify the domain and range of g.

11. Determine the intervals on which the function is increasing and decreasing.

***A function is given. Determine the average rate of change of the function between the given values.***

12. f(x) = 3x – 2; x = 2, x = 3 13.

***Suppose the graph of f is given. Describe how the graph of g could be obtained from f.***

14. g(x) = f(x) – 5 15. g(x) = f(x – 5) + 2 16. g(x) = 3f(x)

17. g(x) = -f(2x) 18. g(x) = f(x + 3) 19. g(x) = f(x) + 1

20. The graph of f is given. Sketch the graph

 of y = –f(x + 1) – 3

***Write the equation for the graph of f with the given transformations.***

21. f(x) = x; shift left 3 units, reflect over the x-axis, and shift down 1 unit.

22. f(x) = ; shift right 2 units, stretch vertically by a factor of 3, and shift up 2 units.

23. f(x) = ; reflect over the y-axis and stretch horizontally by a factor of 2.

24. Given 

 a) Find the axis of symmetry.

 b) Find the vertex.

1. Find the maximum or minimum value.

25. Express  in standard form. Describe the transformations on the parent function.

***Find the local maximum and minimum values of the function.***

26. 27. f(x) = x– 2x– 11x

28. The profit P (in dollars) generated by selling x units of a certain commodity is given by *P(x) = –1500 + 12x – 0.0004x.* What is the maximum profit? How many units must be sold to generate it?

29. If the perimeter of a rectangular garden is to be 480 ft., find the dimensions of the garden that would give the largest area. What is the maximum area?

30. A rancher wants to build a rectangular pig pen with an area of 100 m2.

 a) Find a function that models the length of fencing required.

 b) Find the pen dimensions that would require the minimum amount of fencing.

***Given f(x) = x+ 2x and g(x) = x– 4, evaluate the following. Then state the domain.***

31. f + g 32. f – g 33. fg

34.  35.  36. 

***Given f(x) = 1 + x and g(x) = , evaluate the following. Then state the domain.***

37.  38.  39. 

***Draw the graph of f and use it to determine if the function is one-to-one.***

40. f(x) = x– x 41. f(x) = 

***Find the inverse of function f.***

42. f(x) = 3 – 5x 43. f(x) = 5 – 4x 44. f(x) = 

**CHAPTER 3 – Polynomial & Rational Functions**

***Evaluate the expression and write the result in a + bi form.***

1. (2 – 6i) + (3 + 4i) 2. (–4 + i) – (2 – 5i) 3. 2i(– i)

4. (5 – 3i)(1 + i) 5.  6. 

7.  8.  9. (3 – )(1 + )

***For each polynomial function, identify the zeros and end behavior. Then graph the function.***

10. 11.

Zeros: Zeros:

End behavior: End behavior:

12. f(x) = –x– 2x + 8x 13. f(x) = x– 2x+ 8x – 16

Zeros: Zeros:

End behavior: End behavior:

***Use long division to find the quotient.***

14. (x – 6x – 8)(x – 4) 15. (3x – 5x – 20x – 5)(x + x + 3)

***Use synthetic division to find the quotient.***

16. (x – 5x + 4)(x – 1) 17. (x – 8x + 2)(x + 3)

***Find the indicated value of the polynomial using the Remainder Theorem.***

18. P(x) = 2x – 9x– 7x + 13; P(5) 19. Q(x) = x+ 4x + 7x+ 10x + 15; Q(-3)

***List all possible rational zeros of the polynomial.***

20. P(x) = x– 3x– 6x + 8 21. P(x) = 6x– x + 2x + 12

***Use Descartes’ Rule of Signs to determine the possible number of positive and negative real zeros for the polynomial.***

22. P(x) = 2x – x + 4x – 7 23. P(x) = x – x + x – x + x – x + 1

***Find all zeros of P. You may use your graphing calculator to help with synthetic solutions, but only to get started – work must be shown.***

24. P(x) = 2x + 5x – 6x – 9 25. P(x) = x + 7x + 9x – 17x – 20

26. 27.

***Find the complete factorization of the following polynomials***

28. P(x) = x + 25 29. P(x) = x – 8x + 17

30. P(x) = x + 10x + 25 31. P(x) = x + 2x + 4x + 8

32. P(x) = x – 81 33. P(x) = x+ 15x+ 54

34. Find a polynomial of least degree with integer coefficients and zeros 4 and 3i.

35. Find a polynomial of degree three with zeros -1, 1, and 3 and in which the constant

 coefficient is 15.

***Use Synthetic or Long Division to rewrite the following functions. Then describe their transformation from the parent function***

36.  37.  38. 

***For each rational function, identify the x- and y-intercepts, asymptotes and sketch a graph of the function.***

39. r(x) =  40. s(x) = 

x-intercept: x-intercept:

y-intercept: y-intercept:

vertical asymptote: vertical asymptote:

horizontal asymptote: horizontal asymptote:

slant asymptote: slant asymptote:

D: D:

**CHAPTER 4 – Exponential & Logarithmic Functions**

***Find the domain of the function.***

1. 2. 3.

***Graph the following functions.***

4. 5.

D:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ D:\_\_\_\_\_\_\_\_\_\_\_\_\_

 R:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ R:\_\_\_\_\_\_\_\_\_\_\_\_\_

 HA:\_\_\_\_\_\_\_\_\_\_\_\_ HA:\_\_\_\_\_\_\_\_\_\_\_\_

6. 7.

D:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ D:\_\_\_\_\_\_\_\_\_\_\_\_\_

 R:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ R:\_\_\_\_\_\_\_\_\_\_\_\_\_

 VA:\_\_\_\_\_\_\_\_\_\_\_\_ VA:\_\_\_\_\_\_\_\_\_\_\_\_

8. Find the exponential function 9. Find the logarithmic function

whose graph is given. whose graph is given.

(2, )

( , -1)

***Express the equation in exponential form.***

10. 11. 12.

***Express the equation in logarithmic form.***

13. 14. 15.

***Evaluate the expression.***

16. 17. 18.

19. 20. 21.

22. 23. + 24.

***Expand the expression.***

25. 26.

***Condense the expression.***

27. 28.

29. Use the change of base formula to evaluate .

***Solve the equation. Find exact answers whenever possible; otherwise, round answers to four decimal places.***

30. 31. 32.

33. 34. 35.

36. 37. 38.

39. Find the time required for an investment of $4000 to increase to $9000 if it is

 compounded quarterly at 6% annual interest.

40. Find the interest rate for an investment of $600 to triple if it is compounded continuously for 9 years?

41. A baseball card increased in value from $15 to $2000 in 25 years. Find its average annual rate of appreciation.

42. A cup of coffee has a temperature of 200°F and is placed in a room that has a temperature of 70°F. After 10 minutes, the coffee has cooled to 150°F. Find the temperature of the coffee after 15 minutes.

43. A man invests $6500 in an account that pays 6% interest per year, compounded continuously.

 a) What is the amount after 2 years?

 b) How long will it take for the amount to be $8000?

44. In 1990, a fish population in a man-made lake began with 150 fish. Since then, the population has had a relative growth rate of 9% per year.

 a) Write a function that models the amount of fish at time t, where t represents the number of years since 1990.

 b) What was the fish population in 2000?

 c) How long will it take the population to reach 2500 fish?

45. The half-life of radium-226 is 1600 years. How long will it take a 22-mg sample to decay to 18-mg?

**Chapter 5/6 – Trigonometric Functions of Angles**

1. Convert to radians. 2. Convert to degrees.

***Find the value of x in the triangle. Number 7 must be exact.***

1000

3. 4. 5.

x

68º

x

25

53º

36º

x

12

6. 7.

85

60º

30º

x

50

65º

60º

x

8. From the top of a 200 ft. lighthouse, the angle of depression to a ship in the ocean is 23º. How far

 is the ship from the base of the lighthouse?

9. To estimate the height of a mountain above a level plain, the angle of elevation to the top of the mountain is measured to be 32º. One thousand feet closer to the mountain along the plain, it is found that the angle of elevation is 35º. Estimate the height of the mountain.

10. Points and (on the same side of a tower) are m apart. The angles of elevation of the

 top of a tower are and respectively. Find the tower’s height.

11. A ship leaves port at 2 p.m. and has a bearing of . The ship sails at knots. How

 many nautical miles south and how many nautical miles west will the ship have traveled

 by 9:30 p.m.?

12. An airplane flying at miles per hour has a bearing of . After flying for hours,

 how far north and how far east has the plane traveled form its point of departure.

13. A plane is 200 miles south and 65 miles east of an airport. The pilot wants to fly directly to

 the airport. What bearing should be taken?

***Find the sign of the expression if the terminal point determined by is in the given quadrant.***

14. ; QII 15. ; QIV

***From the information given, find the quadrant in which lies.***

16. and 17. and

***Find the value of the trigonometric functions of given the quadrant in which the terminal point lies.***

18. ; Quad II 19. ; Quad III

***Find the missing coordinate of P, using the fact that P lies on the unit circle in the given quadrant.***

20. ; Quad III 21. ; Quad II 22. ; Quad IV

***Find a) the reference angle and b) the terminal point P(x, y) determined by the angle.***

23. 24.

25. 26. 960º

***Find the exact value of the trigonometric function.***

27. 28. 29.

30. 31. 32.

33. Find the length of an arc that subtends 34. Find the area of a sector with central angle

 a central angle of in a circle with in a circle with radius 3 mi.

 radius 10 m.

35. A woman is riding a bicycle whose wheels are 28 in. in diameter. If the wheels rotate at

 130 revolutions per minute (rpm), find the speed at which she is traveling in mi/h.

36. A boy rotates a stone in a 3 ft. long sling at the rate of 15 revolutions every 10 seconds.

 Find the linear and angular velocities of the stone.

***Find the amplitude, period, vertical shift, and phase shift of the function. Then graph the function.***

37.

Amplitude:\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Phase Shift:\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Vertical Shift:\_\_\_\_\_\_\_\_\_\_\_\_

***Use the graph to find the amplitude, period, and phase shift of the curve. Then write an equation that represents the curve.***

38. 39.

3

0

-2

2

0

-3

Amplitude:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amplitude:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Phase Shift:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Phase Shift:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Equation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Equation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Identify whether the graph represents .***

40. 41.

1

-1

1

-1

42. 43.

-1

1

1

--1