

## 1ST SEM PRACTICE FINAL - VER A

Period \_\_\_\_\_

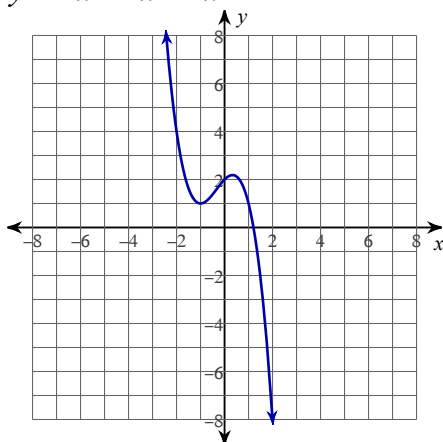
**COMPOSITION OF FUNCTIONS****Find the composition of functions. Simplify and show all work.**

1)  $h(x) = 2x - 3$   
 $g(x) = x^3 - 1$   
Find  $(h \circ g)(x)$

2)  $g(n) = 4n - 2$   
 $h(n) = -n^2 + 3n$   
Find  $(g \circ h)(4)$

**INCREASING/DECREASING****Use a graphing calculator to determine the intervals where each function is INCREASING.****Use Interval Notation. Use 3 decimal place (if needed).**

3)  $y = -x^3 - x^2 + x + 2$

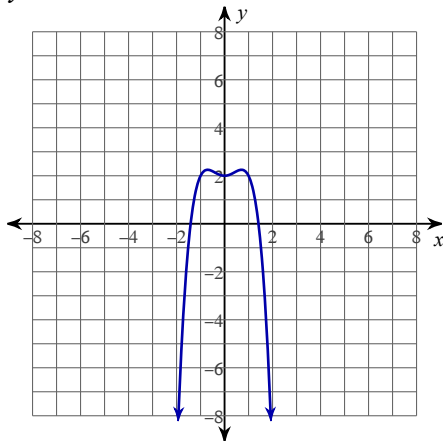


## EXTREMA

Use a graphing calculator to find all points of relative extrema.

Use 3 decimal places.

4)  $y = -x^4 + x^2 + 2$



## DISCONTINUITY

Determine if each function is continuous.

If not continuous, classify each discontinuity using the correct terminology.

5)  $f(x) = \frac{x - 1}{x^2 - 3x - 4};$

6)  $f(x) = \begin{cases} -5, & x \leq -1 \\ -x^2 - 2x - 2, & x > -1 \end{cases};$

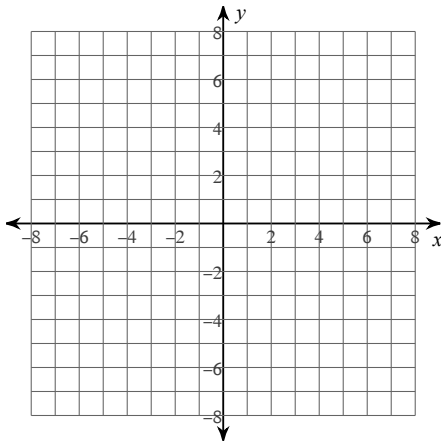
7)  $f(x) = \begin{cases} -x^2 + 12x - 36, & x \neq 5 \\ -2, & x = 5 \end{cases};$

8)  $f(x) = x^3 - 2x^2 - 3;$

## PIECEWISE FUNCTIONS

Sketch the graph of each function.

$$9) f(x) = \begin{cases} x + 4, & x < -4 \\ -x, & -4 \leq x \leq 2 \\ 3, & x > 2 \end{cases}$$



## PARAMETRIC EQUATIONS

Eliminate the parameter. Don't simplify.

$$10) x = 3t^2 + 2t + \frac{1}{3}, y = -3t - 1$$

## INVERSE FUNCTIONS

Find the inverse of the below function.

Must show work. Use correct inverse notation.

$$11) h(x) = \frac{2}{-x + 3} - 2$$

## INVERSE FUNCTIONS - CHECKING ALGEBRAICALLY (Composite Functions)

Show algebraically by using composite functions whether or not the given functions are inverses of each other. Must show work.

Are the below functions inverses of each other: Yes or No

$$12) g(x) = -2x + 6$$

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

## DIVIDING POLYNOMIALS

Divide using Polynomial Division. Write your answer in fraction form.

13)  $(4x^4 - 24x^3 + 29x^2 + 6x + 3) \div (x^2 - 4x)$

## VERTICAL/HORIZONTAL/END-BEHAVIOR ASYMPTOTES AND HOLES

For each function below, identify the holes and asymptotes (vertical/horizontal/end behavior). Write the equation(s) of the asymptote(s).

14)  $f(x) = \frac{x^3 + x^2 - 6x}{3x^2 - 3x - 36}$

Holes:

Vert. Asymptotes:

Horiz. Asymptotes:

Other End Behavior Asymptotes:

15)  $f(x) = \frac{2x^2 - 4x - 16}{x^2 + x - 2}$

Holes:

Vert. Asymptotes:

Horiz. Asymptotes:

Other End Behavior Asymptotes:

16)  $f(x) = \frac{x^2 + 2x - 3}{4x + 16}$

Holes:

Vert. Asymptotes:

Horiz. Asymptotes:

Other End Behavior Asymptotes:

17)  $f(x) = \frac{x^2 - x - 2}{4x^2 - 12x}$

Holes:

Vert. Asymptotes:

Horiz. Asymptotes:

Other End Behavior Asymptotes:

## **SOLVING RATIONAL EQUATIONS**

**Solve each equation. Remember to check for extraneous solutions.**

$$18) \frac{4x^2 - 9x + 2}{5x} - \frac{2x^2 - x - 3}{x} = \frac{1}{5x}$$

$$19) \frac{6v - 5}{v} + \frac{1}{v^2 - v} = \frac{2}{v - 1}$$

## **SOLVING RATIONAL INEQUALITIES**

**Use a SIGN CHART to solve each inequality.**

$$20) (-x + 6)(x + 8)(x - 6) \leq 0$$

$$21) \frac{(x - 6)(x - 5)}{x - 1} > 0$$

$$22) \frac{x + 12}{5x - 35} \geq 4$$

## **SOLVING POLYNOMIAL INEQUALITIES GRAPHICALLY**

**Use a Graphing Calculator to solve each inequality.**

23)  $x^3 + 3x^2 + 3x + 1 < 0$

24)  $x^3 + 29x^2 + 77x + 98 < 13x^2$

## **FACTORING QUADRATIC FUNCTIONS**

**Factor the below quadratic function without a calculator.**

25)  $f(x) = 3x^2 + 11x - 4$

## **FACTORING POLYNOMIALS**

**Use a Calculator, Synthetic Division and the Quadratic Formula to write a linear factorization of the function.**

26)  $f(x) = x^3 + 3x^2 - 32x - 40$

## **REMAINDER THEOREM**

**Find the remainder when  $f(x)$  is divided by  $x - k$ .**

**Hint: Use The Remainder Theorem**

27)  $f(x) = x^7 + 3x^5 - 5x^4 + 5x^3 - 3x^2 + 5x + 5$   
 $k = 1$

**DIVIDING POLYNOMIALS - SYNTHETIC DIVISION**

Use Synthetic Division to divide. Write your answer in fraction form.

28)  $(x^4 - 2x^3 - 15x^2 + x + 13) \div (x + 3)$

**FUNDAMENTAL THEOREM OF ALGEBRA AND COMPLEX ZEROS**

State the number of complex zeros (a+bi) for each function.

29)  $f(x) = 27x^7 + 91x^4 + 64x$

30)  $f(x) = x^3 - 11x^2 + 22x + 6$

**FINDING ZEROS**

Use a graphing calculator and synthetic division to determine the real zeros and state the multiplicity of any repeated zeros.

31)  $f(x) = 2x^3 + x^2 - 3x$

**COMPLETING THE SQUARE**

Use completing the square to write the vertex form of the below parabola.

32)  $y = x^2 + 4x + 8$

33)  $y = 4x^2 + 48x + 143$

**ZEROS - MULTIPLICITY**

Use a graphing calculator and synthetic division to determine the real zeros and state the multiplicity of any repeated zeros.

34)  $f(x) = -x^3 + 2x^2 - x$

**LOGARITHMIC FORM**

Rewrite the below equation in logarithmic form.

35)  $19^x = 158$

**SOLVING EXPONENTIAL EQUATIONS**

USE A CALCULATOR to assist you in solving the below equation up to 3 decimal places. Show all work.

36)  $8 \cdot 10^{r-3} = 1$

37)  $6.5 \cdot 11^{4v} = 14$

**LOGARITHM - DOMAIN AND RANGE**

Identify the domain and range of each.

38)  $y = \log_6(x + 6) + 4$



**Evaluate the below expression without a calculator. Show all work.**

39)  $125^{3x} = 625$

40)  $\log_3 27$

**SOLVING LOGARITHMIC EQUATIONS**

**Solve the below equation without a calculator.**

**Find the exact value (leave as a fraction with no decimals)**

41)  $7 + 6\log_2 (-9x + 5) = -5$

42)  $\log_8 (x + 1) - \log_8 x = 2$

43)  $\log_2 5x^2 + \log_2 10 = 5$

44)  $8 + \log_{11} (p + 8) = 9$

**Find the inverse function. Show all work.**

45)  $y = \log_3 (2^x + 10)$

### NEWTON'S LAW OF COOLING

- 46) If a fresh cup of coffee is 120°F and placed in a room at 70°F

$$Tf - Ts = (To - Ts) \cdot e^{-kt} \quad (\text{t is in minutes})$$

How long will it take the coffee to cool to 80°F, if the Constant of Cooling (k) is 0.0245?

### HALF LIFE

- 47) The half-life of a certain radioactive substance is 15 days. There 18g present initially. When will there be 3g remaining?

### EVALUATING TRIG FUNCTIONS

Find the exact value of each trigonometric function.

No Work Required. No Partial Credit. Box Answer!

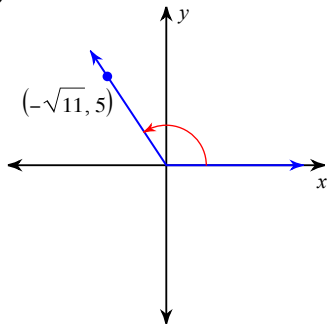
48)  $\cos \frac{5\pi}{3}$

49)  $\sin \frac{4\pi}{3}$

### FINDING TRIG RATIOS

Use the given point on the terminal side of angle  $\theta$  to find the value of the trigonometric function indicated. **Box Answer!**

50)  $\sin \theta$



### FINDING TRIG RATIOS

Find the exact values of  $\sin \theta$  and  $\tan \theta$ . **Box Answers!**

51)  $\cos \theta = -\frac{\sqrt{17}}{9}$  and  $\sin \theta < 0$

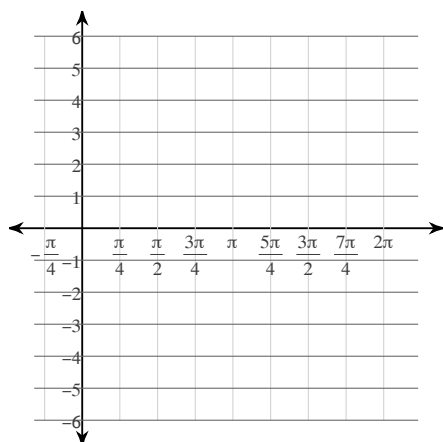
### PHASE SHIFT

Find the phase shift in radians. Indicate which direction the phase shift is (left or right). **Box Answers!**

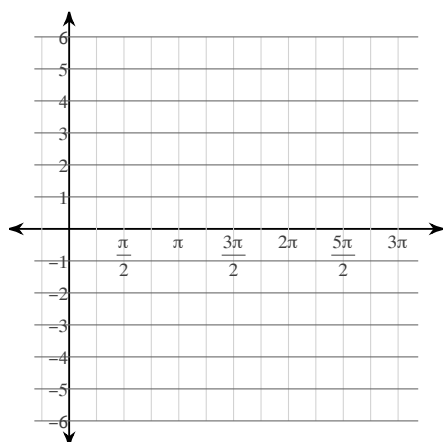
52)  $y = 3\cos\left(\frac{\theta}{2} + \frac{\pi}{3}\right)$

**Graph the function below.  
Only one cycle is needed.**

53)  $y = 4\sin 2\theta + 2$

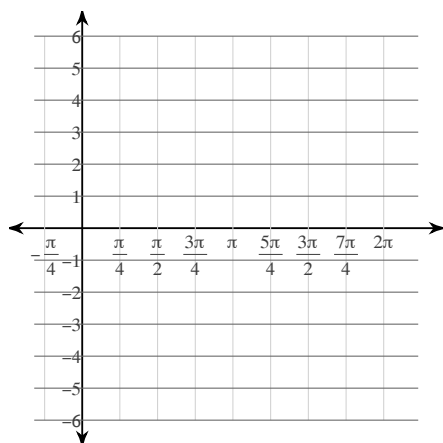


54)  $y = 1 + 4\cos \theta$



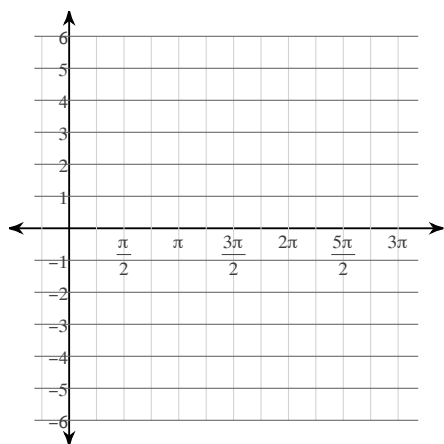
**Graph each function using radians. Draw Vertical Asymptotes as dotted line (required).**

55)  $y = \cot 2\theta$

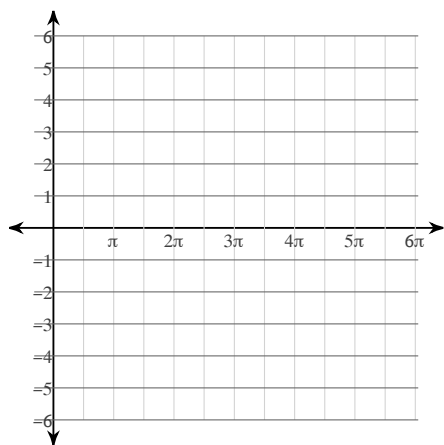


Graph each function using radians. Draw Vertical Asymptotes as dotted line (required).

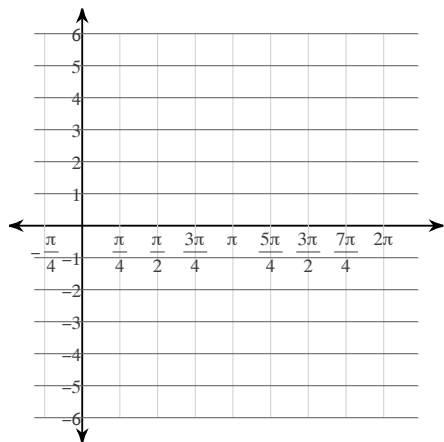
56)  $y = \tan \frac{\theta}{2}$



57)  $y = -2 + 2\csc \frac{\theta}{2}$



58)  $y = 3\sec 2\theta + 1$



**EVALUATING SIMPLE TRIG EQUATIONS**

Solve each equation for  $0 \leq \theta < 2\pi$ . No Work Required. No Partial Credit.

$$59) \sin \theta = -\frac{\sqrt{3}}{2}$$

$$60) \frac{1}{2} = \cos \theta$$

$$61) \tan \theta = 1$$

**EVALUATING INVERSE TRIG FUNCTIONS**

Find the exact value of each expression. No Work Required. No Partial Credit. Box Answers!.

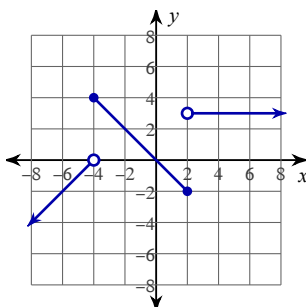
$$62) \sin^{-1} \frac{\sqrt{2}}{2}$$

$$63) \cos^{-1} -\frac{\sqrt{2}}{2}$$

$$64) \tan^{-1} (-\sqrt{3})$$

# Answers to 1ST SEM PRACTICE FINAL - VER A

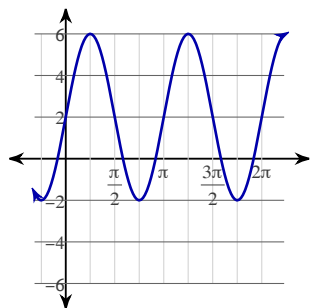
- 1)  $2x^3 - 5$       2)  $-18$   
 3) Increasing:  $(-1, 0.3)$  Decreasing:  $(-\infty, -1), (0.3, \infty)$   
 4) Relative minimum:  $(0, 2)$       5) Infinite discontinuities at  $x = -1, x = 4$   
 Relative maxima:  $(-0.7, 2.3), (0.7, 2.3)$   
 6) Jump discontinuity at  $x = -1$       7) Removable discontinuity at  $x = 5$   
 8) Continuous at  $x = -1$       9)



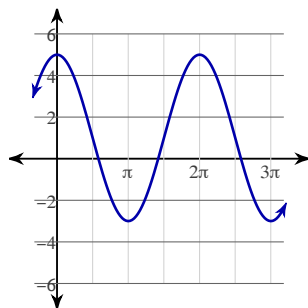
10)  $x = \frac{y^2}{3}$

- 11)  $h^{-1}(x) = -\frac{2}{x+2} + 3$       12) No      13)  $4x^2 - 8x - 3 + \frac{-6x+3}{x^2-4x}$   
 14) Holes:  $x = -3$   
 Horz. Asym.: None  
 End behavior asym.:  $y = \frac{x}{3} + \frac{2}{3}$       15) Holes:  $x = -2$   
 Horz. Asym.:  $y = 2$   
 End behavior asym.:  $y = 2$   
 16) Holes: None  
 Horz. Asym.: None  
 End behavior asym.:  $y = \frac{x}{4} - \frac{1}{2}$       17) Holes: None  
 Horz. Asym.:  $y = \frac{1}{4}$   
 End behavior asym.:  $y = \frac{1}{4}$   
 18)  $\left\{\frac{4}{3}, -2\right\}$       19)  $\left\{\frac{3}{2}, \frac{2}{3}\right\}$       20)  $[-8, \infty)$       21)  $(1, 5) \cup (6, \infty)$   
 22)  $(7, 8]$       23)  $(-\infty, -1)$       24)  $(-\infty, -7) \cup (-7, -2)$   
 25)  $f(x) = (3x-1)(x+4)$       26)  $f(x) = (x-5)(x+4-2\sqrt{2})(x+4+2\sqrt{2})$   
 27) 11      28)  $x^3 - 5x^2 + 1 + \frac{10}{x+3}$       29) 7  
 30) 3      31)  $\left\{0, 1, -\frac{3}{2}\right\}$       32)  $y = (x+2)^2 + 4$       33)  $y = 4(x+6)^2 - 1$   
 34)  $\{0, 1 \text{ mult. } 2\}$       35)  $\log_{19} 158 = x$       36) 2.0969      37) 0.08  
 38) Domain:  $x > -6$   
 Range: All reals      39)  $\left\{\frac{4}{9}\right\}$       40) 3      41)  $\left\{\frac{19}{36}\right\}$   
 42)  $\left\{\frac{1}{63}\right\}$       43)  $\left\{\frac{4}{5}, -\frac{4}{5}\right\}$       44)  $\{3\}$       45)  $y = \log_2 (3^x - 10)$   
 46)  $t = 65.691$  minutes      47)  $t = 38.774$  days      48)  $\frac{1}{2}$       49)  $-\frac{\sqrt{3}}{2}$   
 50)  $\frac{5}{6}$       51)  $\sin \theta = -\frac{8}{9}, \tan \theta = \frac{8\sqrt{17}}{17}$       52) Left  $\frac{2\pi}{3}$

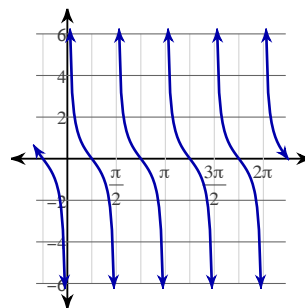
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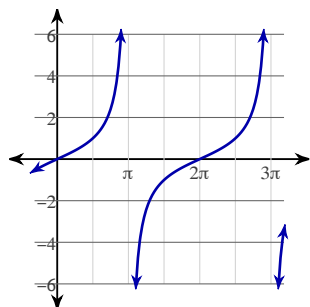
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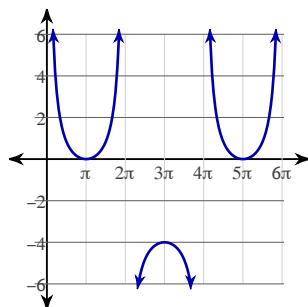
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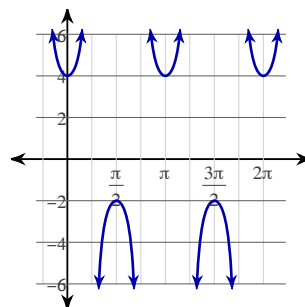
56)



57)



58)



59)  $\left\{ \frac{4\pi}{3}, \frac{5\pi}{3} \right\}$

60)  $\left\{ \frac{\pi}{3}, \frac{5\pi}{3} \right\}$

61)  $\left\{ \frac{\pi}{4}, \frac{5\pi}{4} \right\}$

62)  $\frac{\pi}{4}$

63)  $\frac{3\pi}{4}$

64)  $-\frac{\pi}{3}$