Summer Assignment 2012   Name:_____

Section I: Analyzing Functions

A. Increasing/Decreasing

1. Determine the interval(s) over which f(x) is:
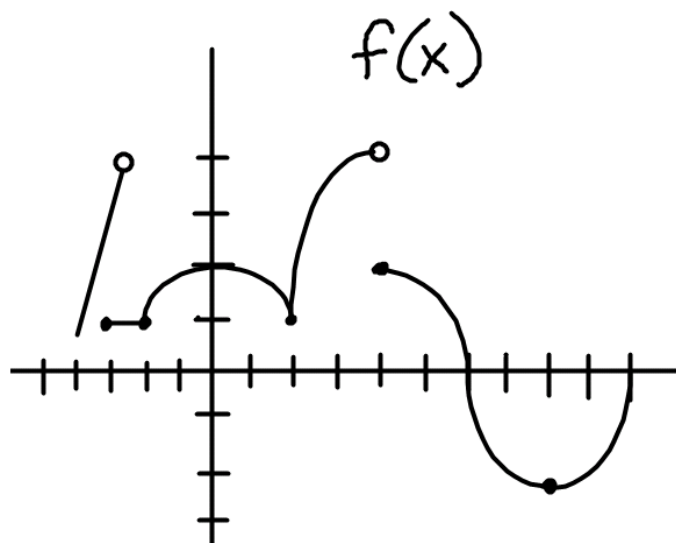
a. Increasing _____

b. Decreasing _____

c. Constant _____

d. Linear _____

e. Concave Up _____

f. What are the zeros of f? _____

g. For what values of x is f(x) discontinuous? _____

$f(x)$

B. Compositions

1. Let $f(x) = 3x^2$ and $g(x) = \dfrac{x-9}{x+1}$, find the following:

a. $f(g(x))$ b. $g(f(x))$ c. $f^{-1}(x)$

d. Domain, Range, and Zeros of f(x)   e. Domain, Range, and Zeros of g(x)

Find f^{-1} and verify that $\left(f \circ f^{-1}\right)(x)=\left(f^{-1} \circ f\right)(x)=x$.

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

4. $f(x)=x^{3}-1$
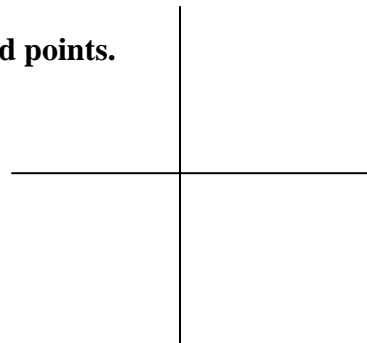
C. Piecewise Functions: Graph then evaluate the function at the indicated points.

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

    a. f(2)   b. f(3)   c. f(5)

2. $f(x)=\begin{cases} x^{2}-1, & x<-2 \\ 4, & -2\leq x \leq 1 \\ 3x+1, & 1<x<3 \\ x^{2}-1, & x>3 \end{cases}$
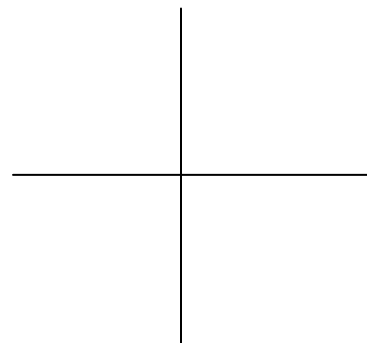
    a. f(-3)   b. f(-2)   c. f(2)   d. f(5)   e) f(3)

D. Even/Odd Functions

Show work to determine if the relation is even, odd, or neither.

1. $f(x) = 2x^2 - 7$

2. $f(x) = -4x^3 - 2x$

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

4. $f(x) = x - \dfrac{1}{x}$

5. $f(x) = |x| - x^2 + 1$

6. $f(x) = \sin x + x$

E. Domains of Functions: Find the Domain of each.

1. $y = \dfrac{3x - 2}{4x + 1}$

2. $y = \dfrac{x^2 - 4}{2x + 4}$

3. $y = \dfrac{x^2 - 5x - 6}{x^2 - 3x - 18}$

4. $y = \dfrac{2^{2-x}}{x}$

5. $y = \sqrt{x-3} - \sqrt{x+3}$

6. $y = \dfrac{\sqrt{2x-9}}{2x+9}$

F. Asymptotes

Find the equation of both Horizontal and Vertical Asymptotes for the following functions. Find the coordinates of any holes.

1. $y = \dfrac{x}{x - 3}$

2. $y = \dfrac{x + 4}{x^2 - 1}$

3. $y = \dfrac{x^2 - 2x + 1}{x^2 - 3x - 4}$

4. $y = \dfrac{x^2 - 9}{x^3 - 3x^2 - 18x}$

Section II. Simplifying and Solving Equations and Inequalities

A. Simplify the following expressions

1. $\dfrac{x}{\sqrt{x+5}-\sqrt{5}}$

2. $\dfrac{\sqrt{2x+3}-\sqrt{3}}{x}$

3. $\dfrac{\dfrac{1}{x}}{x-\dfrac{1}{2}}$

4. $\dfrac{x-\dfrac{1}{2x}}{x+\dfrac{1}{3x}}$

5. $x^4 + 11x^2 - 80$

6. $e^x(2x+1)^3 + e^{2x}(2x+1)^2$

7. $x^3 - xy^2 + x^2 y - y^3$

B. Solving Equations- Solve the following for x:

1. $x^2 - 9 = 0$

2. $3x^2 + 7x + 3 = 0$

3. $x^2 - 5x - 24 = 0$

4. $\dfrac{2x+5}{3x+1} = 0$

5. $\sin x = \dfrac{1}{2}$

6. $\ln x = 3$

7. $\ln x = 1$

8. $\ln x = e$

9. $\cos^2 x = \dfrac{1}{4}$

10. $2\sin^2 x + \sin x = 1$

11. $2\sin x \cos x = 0$

13. $x^4 - 9x^2 + 8 = 0$

14. $x - 10\sqrt{x} + 9 = 0$

15. $\dfrac{60}{x} - \dfrac{60}{x-5} = \dfrac{2}{x}$

16. $\dfrac{2x+3}{x-1} = \dfrac{10}{x^2-1} + \dfrac{2x-3}{x+1}$

C. Solving Inequalities: Solve and graph the solution

1. $|x-3|>12$

2. $|x-3|\le 4$

_____   _____

3. $|10x+8|>2$

4. $x^2-16<0$

_____   _____

5. $x^2+6x-16\le 0$

6. $x^2-3x\ge 10$

_____   _____

Section III: Evaluation Functions

A. Evaluate Trig Functions without a calculator:

1. $\cos \pi$

2. $\sin \dfrac{\pi}{6}$

3. $\sec 210^\circ$

4. $\tan 90^\circ$

5. $\csc(-150)$

6. $\csc \dfrac{3\pi}{2}$

7. $\cos 0$

8. $\sin^{-1} \dfrac{-1}{2}$

9. $\cos^{-1} \dfrac{-\sqrt{3}}{2}$

10. $\tan^{-1} 1$

11. $\arcsin 0$

12. $\tan^{-1} -\sqrt{3}$

13. $\sin \dfrac{2\pi}{3}$

14. $\sin^{-1} \dfrac{\sqrt{2}}{2}$

15. $\arctan 0$

B. Evaluate Logarithms and Exponentials without a calculator

1. $\log_4 64$

2. $\log_3 \dfrac{1}{9}$

3. $\log 10$

4. $\ln e$

5. $\ln 1$

6. $\ln e^3$

7. $3^{\log_3 7}$

8. $4^{\log_4 \sin x}$

Section IV: Lines

A. Find the equation of the line using point-slope form : $y - y_1 = m(x - x_1)$

1. (2, 3), (5, 6)

2. (12, 1), (5, 0)

3. (5, 5), (8, 5)

4. (-3, 7), (-3, 14)

5. (-11, -12), (-15, -4)

B. Using the above, write the equation of the lines that are parallel and perpendicular through the point (1, 1).

6.   Parallel to # 1   Perpendicular to # 1

7.   Parallel to # 2   Perpendicular to # 2

8.   Parallel to # 3   Perpendicular to # 3

9.   Parallel to # 4   Perpendicular to # 4

10.   Parallel to # 5   Perpendicular to # 5

Memorize the following Trig Identities:

$$\sin^2 \theta + \cos^2 \theta = 1 \qquad \sec^2 \theta = 1 + \tan^2 \theta \qquad \csc^2 \theta = 1 + \cot^2 \theta$$

$$\sin(-\theta) = -\sin \theta \qquad \cos(-\theta) = \cos \theta \qquad \tan(-\theta) = -\tan \theta$$

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2} \qquad\qquad \sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$

$$\sin 2\theta = 2\sin \theta \cos \theta \qquad\qquad \cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

Graph each of the following Parent Functions:

1. $f(x) = x$

2. $f(x) = x^2$

3. $f(x) = x^3$

4. $f(x) = |x|$

5. $f(x) = \sqrt{x}$

6. $f(x) = \dfrac{1}{x}$

7. $f(x) = \dfrac{1}{x^2}$

8. $f(x) = e^x$

9. $f(x) = \ln x$

10. $f(x) = \tan x$

11. $f(x) = \sin x$

12. $f(x) = \cos x$

13. $f(x) = \tan^{-1} x$

14. $f(x) = x^{\frac{2}{3}}$

15. $f(x) = \dfrac{1}{1+x^2}$

16. $f(x) = [\![x]\!]$

17. $f(x) = \sqrt{1-x^2}$

18. $f(x) = \dfrac{|x|}{x}$

Exponential and Logarithm Rules

$\ln e = 1 \qquad\qquad \ln 1 = 0 \qquad\qquad \ln 0 = \text{undefined}$

$\log_a a = 1 \qquad\qquad \log_a 1 = 0 \qquad\qquad \log_a 0 = \text{undefined}$

$\log a + \log b = \log ab \qquad \log a - \log b = \log \dfrac{a}{b} \qquad \log a^b = b \log a$

$a^{\log_a x} = x \qquad\qquad e^{\ln x} = x \qquad\qquad \log_a a^x = x \qquad \ln e^x = x$