MA181 Professor Katiraie Fall 2005 Test ONE Total Possible Points = 142 Points

Name: Key

(Problems on This Page are Worth 2 Points Each)

Determine if the function is even, odd, or neither. (Justify your answers)

1) $f(x) = 5x^5 + 8x^3$ $\quad f(-x) = 5(-x)^5 + 8(-x)^3 = -5x^5 - 8x^3 = -f(x)$ odd

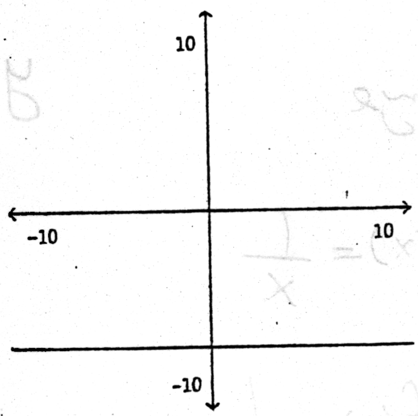
2) $g(x) = \dfrac{-9x}{x^2 + 2}$ $\quad g(-x) = \dfrac{-9(-x)}{(-x)^2+2} = \dfrac{9x}{x^2+2} = -g(x)$ odd

3) $f(x) = \dfrac{2}{x^2 + 2}$ $\quad$ Even $\quad f(-x) = \dfrac{2}{(-x)^2+2} = \dfrac{2}{x^2+2} = f(x)$

4) $h(t) = \sqrt{t^2 - 9}$ $\quad h(-t) = \sqrt{(-t)^2 - 9} = \sqrt{t^2 - 9}$ Even

Determine if the graph is symmetric with respect to x-axis, y-axis, or origin.

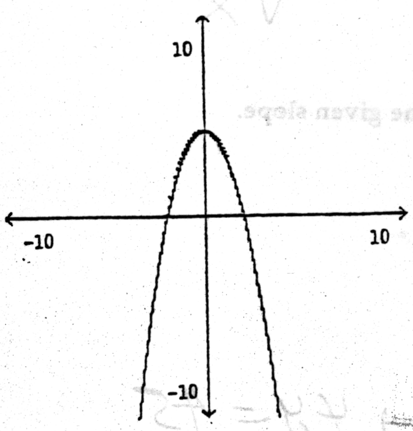
5)



Symmetric w.r.t y axis

$f(-x) = f(x)$

6)



Symmetric w.r.t y axis

$f(-x) = f(x)$

(Problems on This Page are Worth 4 Points Each)

Find domain and range of the function.

7) $f(x) = \dfrac{1}{1+\sqrt{x}}$ $x \geq 0$ Domain: Range $0 < y \leq 1$

8) $f(x) = \sqrt[3]{x+3}$ Domain all R ; Range all Reals.

9) $f(x) = \dfrac{6}{7\sqrt{x}}$ Domain: $x > 0$ Range: $y > 0$

$y = \dfrac{3}{x}$ D: R except zero

10) $f(x) = \sqrt{25 - x^2}$ $-5 \leq x \leq 5$ Range $0 \leq y \leq 5$

11) $f(x) = \dfrac{-3}{\sqrt{x+1}}$ Domain $x+1 > 0$ $\boxed{x > -1}$ Range: $y < 0$

12) $f(x) = 9 - x^2$ Domain all Reals ; Range $y \leq 9$

13) $f(x) = -5 - \sqrt{x}$ Domain $x \geq 0$; Range $y \leq -5$

Find functions f and g such that $y = f(g(x))$.

14) $y = \dfrac{1}{x^2 - 8}$ let $g(x) = x^2 - 8$; $f(x) = \dfrac{1}{x}$

15) $y = \dfrac{1}{\sqrt{3x+5}}$ let $g(x) = 3x+5$ $f(x) = \dfrac{1}{\sqrt{x}}$

Find the missing coordinate value for which the line through A and B has the given slope.

16) $A(-8, 9)$, $B(1, y)$, $m = \dfrac{1}{4}$

$$\frac{1}{4} = \frac{y-9}{1--8}$$

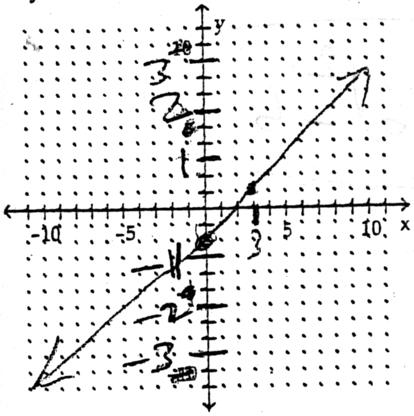
$4y - 36 = 9$ $4y = 36 + 9$ $\Rightarrow 4y = 45$

$y = \dfrac{45}{4}$

(Problems on This Page are Worth 5 Points Each)

Find the y-intercept and slope, and graph the line.

17) $15y - 5x = -10$



$15y = 5x - 10$

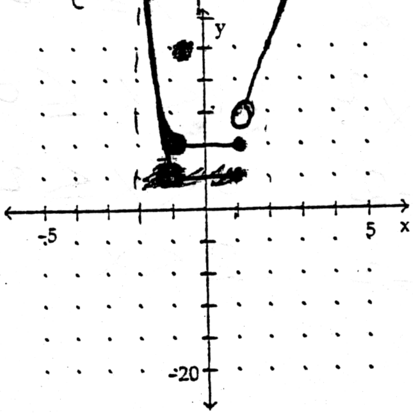
$y = \frac{5x}{15} - \frac{10}{15}$

$y = \frac{1}{3}x - \frac{2}{3}$

slope $\frac{1}{3}$; yintercept $(0, -\frac{2}{3})$

Graph the function.

18) $f(x) = \begin{cases} 2x^2, & x \le -1 \\ 2, & -1 < x \le 1 \\ 2x + 1, & x > 1 \end{cases}$



x	y
−1	2
−2	8
−3	18

$x \le -1$

x	y
0	2
1	2

$-1 < x \le 1$

x	$y = 2x + 1$
2	5
3	7
4	9

Solve the problem.

19) Given $f(x) = 4x^2 + 2x + 7$ and $g(x) = 2x - 3$, find $g(f(x))$.

$g(f(x)) = 2(4x^2 + 2x + 7) - 3 = 8x^2 + 4x + 14 - 3 = \boxed{8x^2 + 4x + 11}$

20) Find the value of k so that the graph of $8y - kx = 4$ and the line containing the points $(5, -8)$ and $(2, 4)$ are parallel.

$8y = kx + 4 \Rightarrow y = \frac{k}{8}x + \frac{4}{8} \Rightarrow m = \frac{k}{8}$

$\frac{k}{8} = \frac{4 - -8}{2 - 5} \Rightarrow -3k = 96 \Rightarrow \boxed{k = -32}$

State the domain and range of the function.

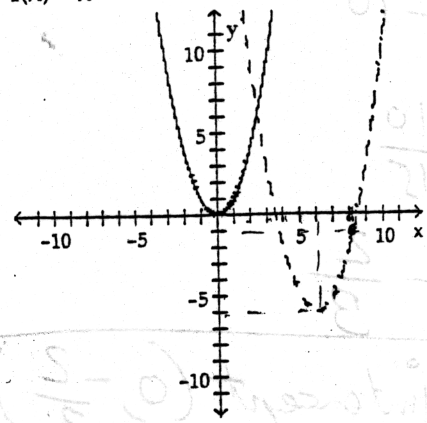
21) $f(x) = -4e^{-x} + 2$

Domain all Reals & Range $y < 2$

(Problems on This Page are Worth 5 Points Each)

The graph of the given function is drawn with a solid line. The graph of a function, g(x), transformed from this one is drawn with a dashed line. Find a formula for g(x).

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



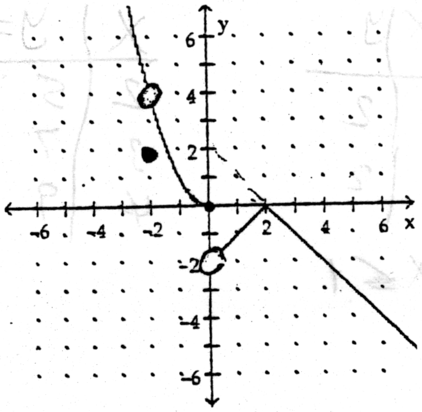
(2,5)

8, -1

$g(x) = (x-6)^2 - 6$

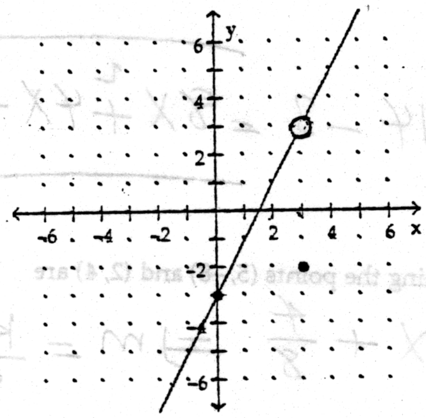
Write a piecewise formula for the function.

23)



$$f(x) = \begin{cases} x^2 & x < -2 \\ 2 & x = -2 \\ x^2 & -2 < x \le 0 \\ x - 2 & 0 < x \le 2 \\ -x + 2 & 2 < x \end{cases}$$

24)



$$f(x) = \begin{cases} 2x - 3 & x < 3 \\ -2 & x = 3 \\ 2x - 3 & 3 < x \end{cases}$$

(3,3)

(0,-3)

$m = \frac{-3-3}{0-3} = \frac{-6}{-3} = 2$

Write an equation for the given line from the information provided.

25)

x	f(x)
2	-6
4	-8
5	-9

$m = \frac{-8 - -6}{4 - 2} = \frac{-8+6}{2} = \frac{-2}{2} = -1$

$y = mx + b$

$-6 = -1(2) + b$

$y = -x - 4$

(Problems on This Page are Worth 5 Points Each)

Write the equation of the line.

26) Through (5, −7), perpendicular to x − y = 103

$\Rightarrow y = x - 103$

$\boxed{m = 1} \Rightarrow \boxed{m_{\perp} = -1}$

$y = -1x + b$

$-7 = 1(5) + b \Rightarrow \boxed{b = -2}$

$\boxed{y = -1x - 2}$

27) Through (1, −2), parallel to −16x + 8y = −27

$8y = 16x - 27$

$y = 2x - \frac{27}{8} \Rightarrow \boxed{m_{\parallel} = 2}$

$-2 = 2(1) + b$

$\boxed{b = -4} \Rightarrow \boxed{y = 2x - 4}$

Solve the problem.

28) (Use the formula $P = Ie^{kt}$) A bacterial culture has an initial population of 10,000. If its population declines to 4000 in 6 hours, what will it be at the end of 8 hours?

$4000 = 10{,}000\, e^{k(6)}$

$\ln \frac{4}{10} = 6k \Rightarrow \boxed{k = -0.153}$

$P = 10{,}000\, e^{(-0.153)(8)}$

$\boxed{= 2940.52 \approx 2941}$

State the domain and range of the function.

29) $f(x) = e^{-x} + 3$

Domain all Reals

Range $y > 3$

Find the inverse of the function.

30) $f(x) = 3x^3 - 4$

$y = 3x^3 - 4$

$x = 3y^3 - 4$

$x + 4 = 3y^3 \Rightarrow$

$y^3 = \frac{x+4}{3}$

$\boxed{f^{-1}(x) = \left(\frac{x+4}{3}\right)^{\frac{1}{3}}}$

Solve the problem.

31) Solve for x.

$1.14^{2x+1} = 2$

$\log 1.14^{2x+1} = \log 2$

$2x + 1 = \frac{\log 2}{\log 1.14} \Rightarrow \boxed{x = \frac{\frac{\log(2)}{\log(1.14)} - 1}{2}} \approx 2.15$

(Problems on This Page are Worth 5 Points Each)

32) Solve for y.

$\ln(y-9) = 4x + \ln x + \ln 4$

$y-9 = e^{4x+\ln x+\ln 4} \Longrightarrow y-9 = e^{4x}\cdot e^{\ln x}\cdot e^{\ln 4}$

$y-9 = 4xe^{4x}$

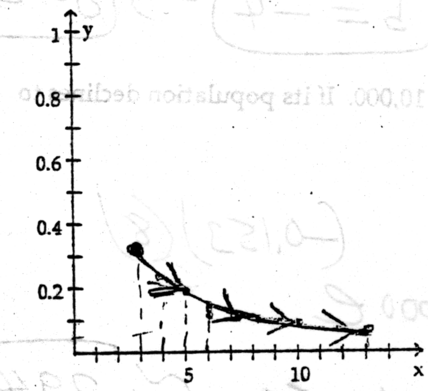
$\boxed{y = 4xe^{4x}+9}$ OR $\boxed{y = e^{4x+\ln x+\ln 4}+9}$

Determine and graph the Cartesian equation that corresponds to the given parametric equations and parameter interval.

33) $x = t+8,\ y = \frac{1}{t+8};\ -5 \le t \le 5$

$\boxed{t = x-8}$

$y = \frac{1}{x-8+8} = \frac{1}{x}$



$3 \le x \le 13$

$0.0769 \le y \le \frac{1}{3}$

34) If $f(x) = \frac{1}{x}+10$, find and simplify $\frac{f(x+h)-f(x)}{h}$

$f(x+h) = \frac{1}{x+h}+10$

$f(x+h)-f(x) = \frac{1}{x+h}+10-\left(\frac{1}{x}+10\right) = \frac{1}{x+h}-\frac{1}{x}$

$= \frac{\cancel{x}-\cancel{x}-h}{x(x+h)}$

$\frac{f(x+h)-f(x)}{h} = \frac{\frac{-h}{x(x+h)}}{h} = \frac{-\cancel{h}}{x(x+h)}\cdot\frac{1}{\cancel{h}}$

$= \boxed{\frac{-1}{x(x+h)}}$