Extra Practice Name KEY
Pre-Calculus (Units 1-4)

For the following problems, use a calculator only when absolutely necessary.

Determine whether the formula determines *y* as a function of *x*. If not, explain why not.

1. $y = \sqrt{x-4}$ yes

2. $x = 2y^2$ $\rightarrow y = \pm\sqrt{\frac{x}{2}}$
no (not a function)

Find the domain and range of the function algebraically and support your answer graphically.

3. $f(x) = x^2 + 4$
D: $(-\infty, \infty)$
R: $[4, \infty)$

4. $f(x) = \frac{3x-1}{(x+3)(x-1)}$
D: $(-\infty, -3) \cup (-3, 1) \cup (1, \infty)$
R: $(-\infty, \infty)$

5. $g(x) = \frac{x}{x^2-5x}$
D: $(-\infty, 0) \cup (0, 5) \cup (5, \infty)$
R: $(-\infty, \frac{-1}{5}) \cup (\frac{-1}{5}, 0) \cup (0, \infty)$

6. $h(x) = \frac{\sqrt{4-x}}{(x+1)(x^2+1)}$
D: $(-\infty, -1) \cup (-1, 4]$
R: $(-\infty, \infty)$

Algebraically prove whether the function is odd, even, or neither.

7. $f(x) = \sqrt{x^2+2}$
EVEN

8. $f(x) = -x^2 + 0.03x + 5$
NEITHER

9. $g(x) = 2x^3 - 3x$
ODD

Confirm that *f* and *g* are inverses by showing that $f(g(x)) = x$ and $g(f(x)) = x$.

10. $f(x) = 3x - 2$ and $g(x) = \frac{x+2}{3}$

$$f(g(x)) = 3\left(\frac{x+2}{3}\right) - 2 = x + 2 - 2 = x$$

$$g(f(x)) = \frac{3x-2+2}{3} = \frac{3x}{3} = x$$

11. $f(x) = x^3 + 1$ and $g(x) = \sqrt[3]{x-1}$

$$f(g(x)) = \left(\sqrt[3]{x-1}\right)^3 + 1 = x - 1 + 1 = x$$

$$g(f(x)) = \sqrt[3]{x^3+1-1} = \sqrt[3]{x^3} = x$$

Algebraically find all horizontal and vertical asymptotes of the function.

12. $f(x) = \frac{x}{x-1}$
H.A. $y = 1$
V.A. $x = 1$

13. $g(x) = \frac{x+2}{3-x}$
H.A $y = -1$
VA $x = 3$

14. $f(x) = \frac{x^2+2}{x^2-1}$
H.A. $y = 1$
V.A. $x = -1$
$x = 1$

15. Using the graph shown below, give the characteristics, in interval notation, of the graph.

A. Intervals Where Increasing (-2,0) (2,∞)

B. Intervals Where Decreasing (-∞,-2) (0,2)

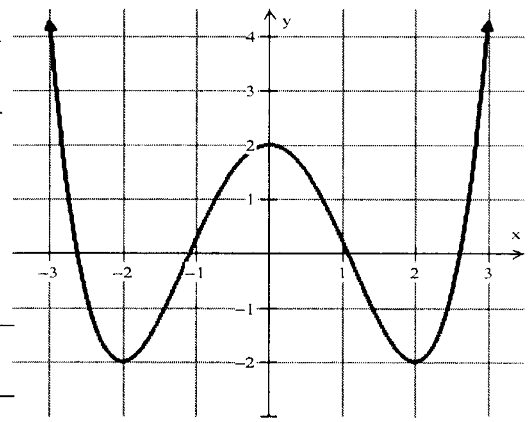
C. Local Maximum(s) 2 when x=0

Local Minimum(s) -2 when x=-2 & x=2

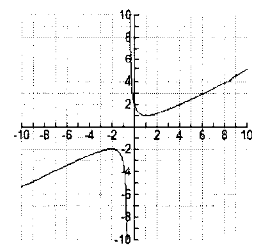
D. Domain (-∞,∞)

E. Range [-2,∞)

F. Boundedness (above, below, both, or neither) below



16. Use proper limit notation to write the end behaviors for the graph of the function.



Left End Behavior:

$\lim_{x\to -\infty} f(x) = -\infty$

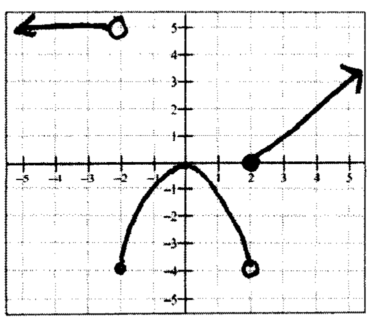
Right End Behavior:

$\lim_{x\to \infty} f(x) = \infty$

17. Accurately graph the following piecewise defined functions. Plot points first!

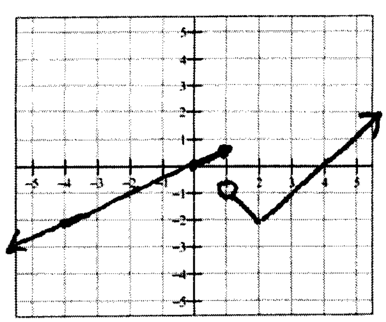
a)

$$f(x)=\begin{cases} 5, & \text{if } x<-2 \\ -x^2, & \text{if } -2\le x<2 \\ x-2, & \text{if } x\ge 2 \end{cases}$$



b)

$$f(x)=\begin{cases} \frac{1}{2}x, & \text{if } x\le 1 \\ |x-2|-2, & \text{if } x>1 \end{cases}$$



c) Evaluate using the piecewise function above (part b):

f(-1) = $-\frac{1}{2}$ f(0) = 0 f(1) = $\frac{1}{2}$ f(2) = -2 f(3) = -1

18) Find two functions defined implicitly by the given relation.

a) $x - y^2 = -7$

$y = \pm\sqrt{x+7}$

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

$y = 2x \pm 2$

19) Use completing the square to determine the vertex form and axis of symmetry for the graph of the quadratic function.

a) $f(x) = 3x^2 - 3x - 7$

$f(x) = 3\left(x - \frac{1}{2}\right)^2 - \frac{31}{4}$

b) $f(x) = -5x^2 + 25x - 12$

$f(x) = -5\left(x - \frac{5}{2}\right)^2 + \frac{77}{4}$

20) Given the vertex of a parabola (-3, 4) and another point on the parabola (4, 1), find a, then write the equation of the parabola in vertex form.

$y = -\frac{3}{49}(x+3)^2 + 4$

21) Find the zeroes of the function algebraically.

a) $f(x) = x^2 + 2x - 8$

$x = -4,\ x = 2$

b) $f(x) = 3x^3 - x^2 - 2x$

$x = 0,\ x = -\frac{2}{3},\ x = 1$

c) $f(x) = x^4 - x^3 - 7x^2 + 5x + 10$

$x = 2,\ \pm\sqrt{5},\ -1$

d) $f(x) = 5x^3 - 24x^2 + x + 12$

$x = \frac{4}{5},\ 2 \pm \sqrt{7}$

22) Solve the equation algebraically. Support your answer numerically and identify any extraneous solutions.

a) $2 - \frac{1}{x+1} = \frac{1}{x^2+x}$

$x = \frac{1}{2}$

b) $\frac{3x}{x+5} + \frac{1}{x-2} = \frac{7}{x^2+3x-10}$

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

23) Evaluate the following logarithms:

a) $\log_5 125$ b) $\log_4 \frac{1}{2}$ c) $\log 1{,}000{,}000$ d) $\log_b 1$ e) $ln(e^x)$

3 $-\frac{1}{2}$ 6 0 x

24) Solve for x in the following logarithmic or exponential equations:

a) $3^{x+5} = 27^{-2x+1}$ b) $log(1 - x) - log(1 + x) = 2$ c) $\log_4 x - 5 = 3$

$x = -\frac{2}{7}$

$x = -\frac{99}{101}$

$x = 4^8 = 65536$

25) What is the equation of an exponential function whose initial value is 12 that also passes through the point (2,3) ?

$y = 12\left(\frac{1}{2}\right)^x$

26) The current population of Lovejoy High School is approximately 950 students, and the population is growing at about 4.5% per year.

a) What is the exponential model for this scenario? $p(t) = 950\,(1.045)^t$

b) What is the growth factor? 1.045

c) What is the growth rate? .045

d) If the population continues to grow exponentially at this rate, how long until the population is 1,380 students?

8.48 yrs

27) What is the equation of a logistic function whose limit to growth is 80, initial value is 5 and whose graph also passes through the point (1,20)?

$y = \frac{80}{1 + 15\left(\frac{1}{5}\right)^x}$

28) Seymour has an ant farm whose population t days after he gets it is found using $P = \frac{1000}{1+49 \cdot 2^{-0.4t}}$

a) What was the ant farm's initial population? 20

b) What is the maximum sustainable population of this ant farm? 1000 ants

c) On what day will the population be 650 ants? $t = 16.27$ (on day 17)

d) What will the population be on day 10? 246 ants