HAT

Name Key

Unit 1 – Functions

Review

1. Determine which numbers in the set are natural numbers.

$\sqrt{81}$, 0, -13, $\sqrt{17}$, -4, 1, 8

2. Identify the rules of algebra for each step:

$(q - 3) + 3 =$

$q + (-3 + 3) =$

$q + 0 =$

q

3. Given $x^2 + y^2 = 9$, use the algebraic tests to determine symmetry with respect to both axes and origin.

x-axis

$x^2 + (-y)^2 = 9$

$x^2 + y^2 = 9$ ✓

y-axis

$(-x)^2 + y^2 = 9$

$x^2 + y^2 = 9$ ✓

origin

$(-x)^2 + (-y)^2 = 9$

$x^2 + y^2 = 9$ ✓

4. Is the following equation represent y as a function of x?

$y^2 - 5x = 2$

$y = \pm\sqrt{2 + 5x}$ NO

5. Find all real values of x such that f(x) = 0

$\frac{3x+7}{x}$

$3x + 7 = 0$

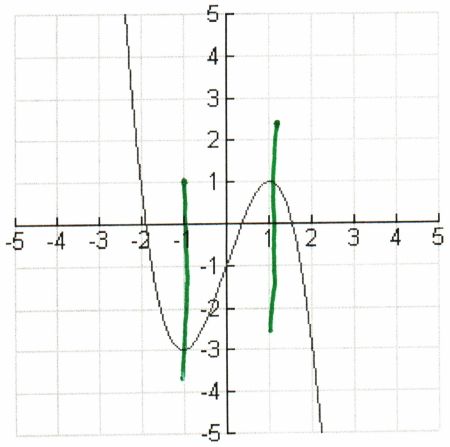
$x = -7/3$

6. Find the domain of the function:

$q(t) = \frac{4t}{t+5}$ all TR's

$t \neq -5$

7. Given the following graph, determine the intervals over which the function is increasing, decreasing, or constant.



inc:
$(-1, 1)$

dec:
$(-\infty, -1)$
$(1, \infty)$

8. Determine whether the function is even, odd, or neither:

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

Neither

even
$y = (-x)^3 - 3(-x)^2 + 5$
$y = -x^3 - 3x^2 + 5$
NO

odd
$-y = -x^3 - 3x^2 + 5$
$y = x^3 + 3x^2 - 5$
NO

For problems 9-13: Given $f(x) = 4x^2 - 7x$ and $g(x) = 9 - x$ find the following:

9. (f – g) (x)

$4x^2 - 6x - 9$

10. (fg) (x)

$(4x^2 - 7x)(9 - x)$
$36x^2 - 4x^3 - 63x + 7x^2$
$-4x^3 + 43x^2 - 63x$

11. $\left(\frac{f}{g}\right)(x)$

$\frac{4x^2 - 7x}{9 - x}$

12. (f + g) (-3)

$4x^2 - 8x + 9$
$4(-3)^2 - 8(-3) + 9$
$36 + 24 + 9$
69

13. f(g(x))

$4(9 - x)^2 - 7(9 - x)$
$4(81 - 18x + x^2) - 63 + 7x$
$324 - 72x + 4x^2 - 63 + 7x$
$4x^2 - 65x + 261$

14. Find the inverse of $f(x) = \sqrt{x+2}$, list the domain of the original and the inverse.

$y = \sqrt{x+2}$ ← all $\mathbb{R}$ $x \geq -2$ D: $[-2, \infty)$

$x = \sqrt{y+2}$ R: $[0, \infty)$

$x^2 = y+2$

$x^2 - 2 = y$ ← all $\mathbb{R}$ $x \geq 0$

15. Verify the following two functions are inverses of each other.

$f(x) = 5x + 1$ $\quad$ $g(x) = \frac{x-1}{5}$

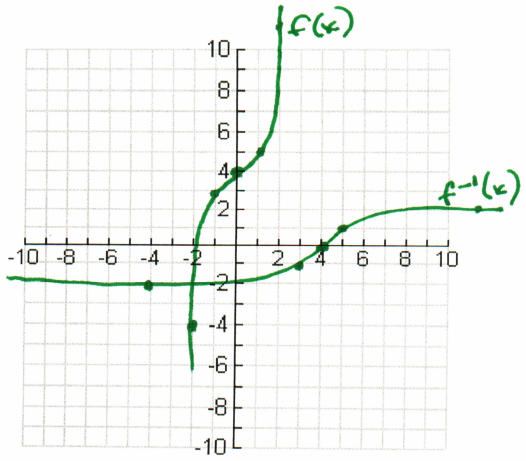
$f(g(x)) = 5\left(\frac{x-1}{5}\right)+1$

$x - 1 + 1 = x$

$g(f(x)) = \frac{(5x+1)-1}{5}$

$= \frac{5x}{5} = x$

16. Graph $f(x) = x^3 + 4$ and its inverse on the same graph.

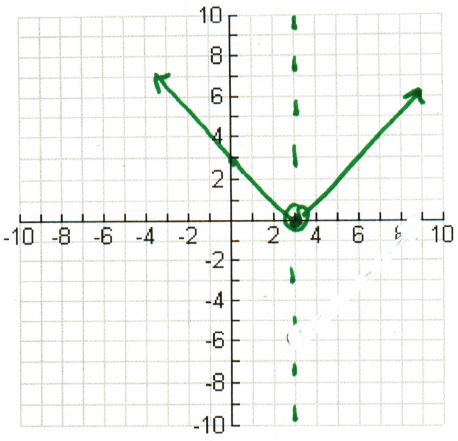


x	f(x)
0	4
-2	-4
-1	3
1	5
2	12

$f^{-1}(x)$

4	0
-4	-2
3	-1
5	1
12	2

17. Graph: $f(x) = \begin{cases} -x+3, for\ x \leq 3 \\ x-3, for\ x > 3 \end{cases}$



18. Write the equation of a square root function that has reflected on the x-axis, vertical stretch of 2, horizontal shift left 1 and a vertical shift down 4.

$f(x) = -2\sqrt{x+1} - 4$

19. Give the parent function, the transformation in words, and domain and range in interval notation of the following:

$f(x) = -|x+3| + 5$

$f(x) = |x|$

left 3

reflected over x axis

up 5

20. Given $f(x) = x^2 + x + 2$, simplify $\frac{f(h+1)-f(3)}{h}$, h≠0

$f(h+1) = (h+1)^2 + (h+1) + 2$

$= h^2 + 2h + 1 + h + 1 + 2$

$= h^2 + 3h + 4$

$f(3) = (3)^2 + 3 + 2$

$h^2 + 3h + 4 - 14$

$\frac{h^2 + 3h - 10}{h}$