Directions: To receive partial credit you must show your work on a problem.

Circle final answers. All problems are 5 points each.

1. Find the slope of the line passing through (4.8, 3.1) and (–5.2, 1.6).

$$\underset{x_1\,y_1}{(4.8,\ 3.1)} \quad \underset{x_2\,y_2}{(-5.2,\ 1.6)}$$

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{1.6-3.1}{-5.2-4.8}$$

$$= \frac{-1.5}{10} = \boxed{.15}\ \checkmark$$

2. Write the equation of the line in slope-intercept form (y = mx + b) that goes through (1, 1) and $\left(6,-\frac{2}{3}\right)$.

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{-\frac{2}{3}-1}{6-1} = \frac{-\frac{2}{3}-\frac{3}{3}}{5} = \frac{-1}{3}$$

$$y-y_1 = m(x-x_1)$$

$$y-1 = -\tfrac{1}{3}(x-1) \longrightarrow \quad y-1 = -\tfrac{1}{3}x+\tfrac{1}{3}$$

$$+1 \qquad\qquad +1$$

$$\boxed{y = -\tfrac{1}{3}x+\tfrac{4}{3}}\ \checkmark$$

3. Find the slope-intercept form of the equation of the line passing through (–10,4) and has slope m = 0.

if m = 0 then horizontal line.

$$y = b \qquad \boxed{y = 4}\ \checkmark$$

4. Write the equation of the line in slope-intercept form (y = mx + b) that goes through (2, 1) and is perpendicular to 4x – 2y = 3.

$$\frac{-2y}{-2} = \frac{-4x+3}{-2} \;\; \frac{}{-2}$$

$$y = 2x - \tfrac{3}{2}$$

$$m = \tfrac{-1}{2}$$

$$y - y_1 = m(x-x_1)$$

$$y - 1 = -\tfrac{1}{2}(x-2)$$

$$y - 1 = -\tfrac{1}{2}x + 1$$

$$+1 \qquad\qquad +1$$

$$\boxed{y = -\tfrac{1}{2}x + 2}\ \checkmark$$

5. Is the following relation a function ?

$$\{(1,2),(5,7),(3,8),(5,4)\}$$

$$\boxed{\text{No, the 5's repeat}}\ \checkmark$$

6. Evaluate the function at each specified value and simplify. $f(x) = \sqrt{x+8} + 2$

a)   f(–8)

$$f(-8) = \sqrt{-8+8} + 2$$

$$f(-8) = \sqrt{0} + 2$$

$$\boxed{f(-8) = 2}\ \checkmark$$

b)   f(1)

$$f(1) = \sqrt{1+8} + 2$$

$$= \sqrt{9} + 2$$

$$= 3 + 2$$
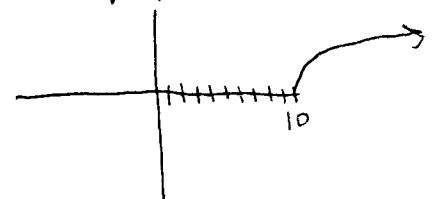
$$\boxed{f(1) = 5}\ \checkmark$$

7.   Evaluate the function at each specified value and simplify. $f(x) = \dfrac{3x-4}{5}$

a)   f(2)

$$f(2) = \frac{3(2)-4}{5}$$

$$= \frac{6-4}{5}$$

$$\boxed{f(2) = \tfrac{2}{5}}\ \checkmark$$

b)   f(–3)

$$f(-3) = \frac{3(-3)-4}{5}$$

$$= \frac{-9-4}{5}$$

$$\boxed{f(-3) = \tfrac{-13}{5}}\ \checkmark$$

8. State the Domain for the following: (Hint: draw graph first.)
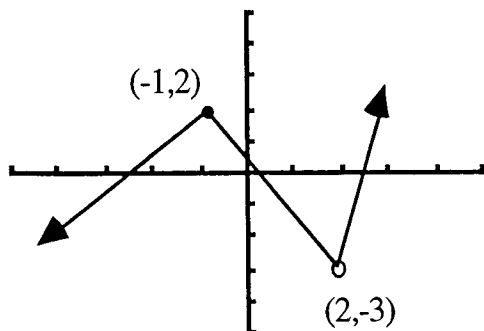
$$g(x) = \sqrt{x-10} \qquad \text{graph:}$$

from looking at the graph

$$\boxed{D = [10, \infty)}\ \checkmark$$

9. Determine the intervals of the domain over which the given functions is increasing, decreasing, and constant.

Increasing $(-\infty,-1] + [2,\infty)$

Decreasing $[-1,2)$
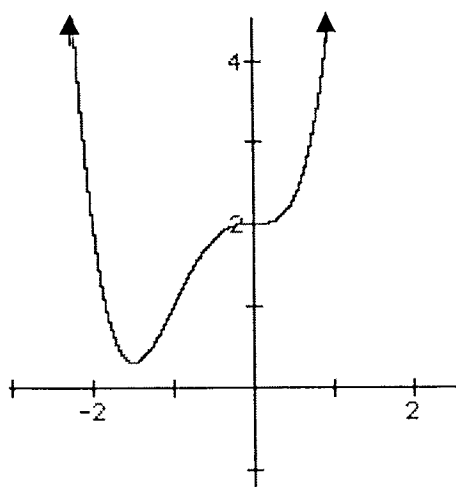
Constant none ✓

(-1,2)

(2,-3)

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10. Is the following graph a function ?
    (Yes) or No

yes, no vertical line intersects in more than one point! ✓

11. State the Domain and Range for the following graph:

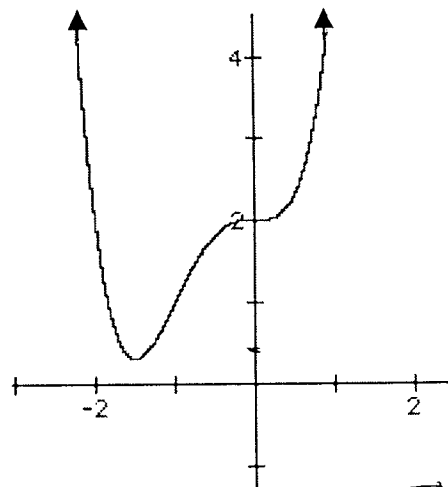Domain = $(-\infty,\infty)$ ✓ Range = $[.5,\infty)$ ✓

↔ ↕

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12. Write an equation for the function that is described as follows:

The shape of f(x) = | x | but moved 10 units up and reflected over the x-axis.

Answer: $f(x) = -|x| - 10$ ✓

13. Write an equation for the function that is described as follows:

The shape of $f(x) = x^3$ but moved 6 units to the left, and 6 units down.
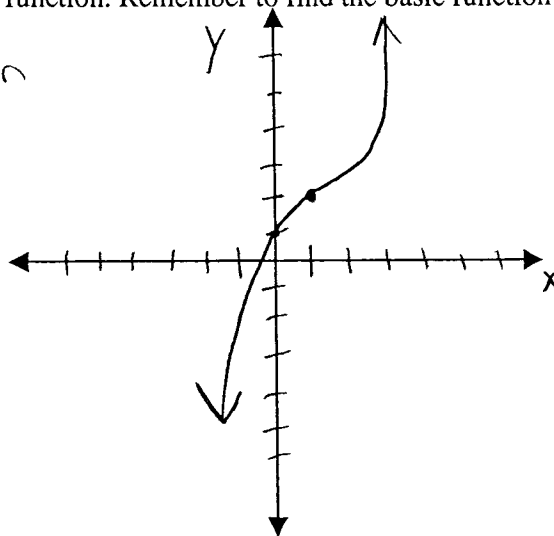
Answer: $f(x) = (x+6)^3 - 6$ ✓

14. Describe the transformation that occurs in the function. Remember to find the basic function first. Also sketch the graph.

$$f(x) = (x-1)^3 + 2$$

basic function

$$Y = X^3$$

Description:

shift 2 units up and 1 unit right

For $f(x) = x^2$ and $g(x) = 2 - x$ Find the following:

15. $(f + g)(x) = f(x) + g(x)$

$$= \boxed{x^2 + 2 - x} \checkmark$$

16. $(f - g)(x) = f(x) - g(x)$

$$= x^2 - (2-x)$$
$$= x^2 - 2 + x = \boxed{x^2 + x - 2} \checkmark$$

17. $(f \cdot g)(x) = f(x) \cdot g(x)$

$$= x^2(2-x) = \boxed{2x^2 - x^3} \checkmark$$

18. $(f / g)(x)$

$$= \frac{f(x)}{g(x)} = \boxed{\frac{x^2}{2-x}} \checkmark$$

For $f(x) = x^2 + 1$ and $g(x) = x - 4$ Find the following:

19. $(f \cdot g)(6) = f(6) \cdot g(6)$

$$= (37) \cdot (2) = \boxed{74} \checkmark$$

20. $(f + g)(2) = f(2) + g(2)$

$$= ((2)^2 + 1) + (2-4)$$
$$= (5) + (-2)$$
$$= \boxed{3} \checkmark$$

For $f(x) = \frac{1}{3}x - 3$ and $g(x) = 3x + 1$ Find the following:

21. $(f \circ g)(x) = f[g(x)]$

$$= \frac{1}{3}(3x+1) - 3 = x + \frac{1}{3} - \frac{3}{1}$$
$$= x + \frac{1}{3} - \frac{9}{3} = \boxed{x - \frac{8}{3}} \checkmark$$

22. $(g \circ f)(12) = g[f(12)]$

$$= g[\frac{1}{3}(12) - 3]$$
$$= g[4-3]$$
$$= g[1] = 3(1)+1 = \boxed{4} \checkmark$$

23. $(f \circ f)(x)$

$$= f[f(x)]$$
$$= \frac{1}{3}(\frac{1}{3}x - 3) - 3$$
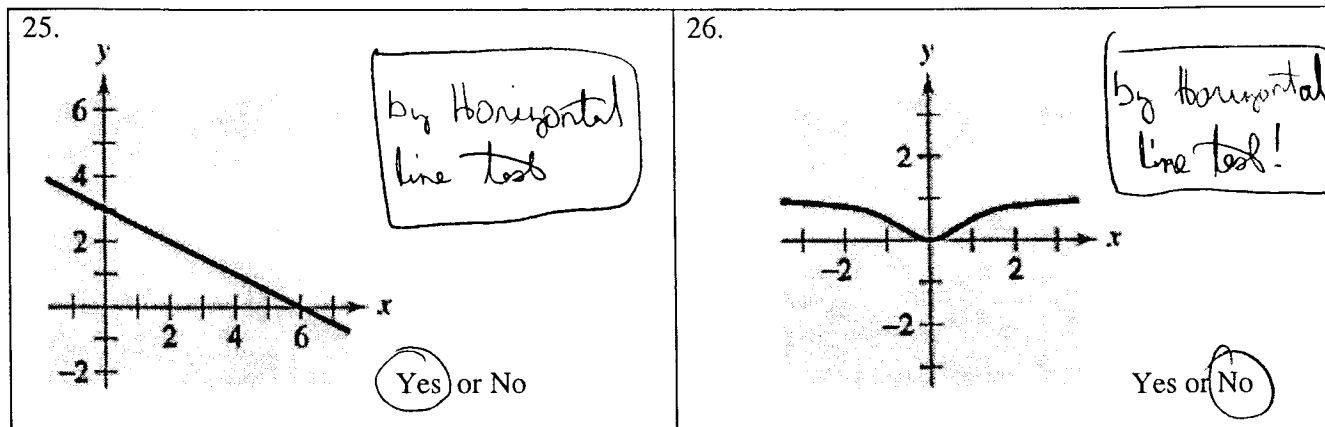$$= \frac{1}{9}x - 1 - 3 = \boxed{\frac{1}{9}x - 4} \checkmark$$

24. $(g \circ g)(2)$

$$= g[g(2)]$$
$$= g[3(2)+1]$$
$$= g[7] = 3(7)+1 = \boxed{22} \checkmark$$

Does the following functions have an inverse ?   Yes or No. Why?

<table>
<tr><td>

25.

by Horizontal
line test

Yes or No
</td><td>

26.

by horizontal
line test!

Yes or No
</td></tr>
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Show that $f(x) = 5x + 1$ and $g(x) = \dfrac{x-1}{5}$ are inverse functions <u>algebraically</u>.

<u>You must show work!</u>

27.   Find $(f \circ g)(x) = f[g(x)]$

$= 5\left(\dfrac{x-1}{5}\right) + 1 = x - 1 + 1 = \boxed{x} \checkmark$

28.   Find $(g \circ f)(x) = g[f(x)]$

$= \dfrac{(5x+1) - 1}{5} = \dfrac{5x}{5} = \boxed{x} \checkmark$

Find the inverse for the following functions. (Note: you don't have to verify)

29. $f(x) = 2x - 3$

$y = 2x - 3$

$x = 2y - 3$
$+3 \qquad +3$

$\dfrac{x+3}{2} = \dfrac{2y}{2}$

$y = \dfrac{x}{2} + \dfrac{3}{2}$

$\boxed{f^{-1}(x) = \dfrac{x}{2} + \dfrac{3}{2}} \checkmark$

30. $f(x) = \dfrac{x+1}{x-2}$

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

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

$x(y-2) = y+1$

$xy - 2x = y + 1$

$xy - y = 2x + 1$

$\dfrac{y(x-1)}{x-1} = \dfrac{2x+1}{x-1}$

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

$\boxed{f^{-1}(x) = \dfrac{2x+1}{x-1}} \checkmark$

Answers to Sample Test 2

1.	$m = 0.15$	2.	$y = \dfrac{-1}{3}x + \dfrac{4}{3}$
3.	$y = 4$	4.	$y = \dfrac{-1}{2}x + 2$

5.	NO the 5's repeat !	6.	a) 2 b) 5
7.	a) 2/5 b) −13/5	8.	$[10, \infty)$
9.	Inc.= $(-\infty, -1]$ and $(2, \infty)$ Decr. = $[-1, 2)$ Const = None	10.	Yes
11.	Domain = $(-\infty, \infty)$ Range = $[0.5, \infty)$	12.	$f(x) = -|x| - 10$

13.	$f(x) = (x + 6)^3 - 6$	14.	Vertical shift of $f(x) = x^3$ 2 units upward and horizontal shift of 1 unit to the right.
15.	$f(x) = x^2 - x + 2$		
16.	$f(x) = x^2 + x - 2$		
17.	$f(x) = x^2(2 - x) = 2x^2 - x^3$		
18.	$f(x) = \dfrac{x^2}{2 - x}$		
19.	74		
20.	3		
21.	$(f \circ g)(x) = x - \dfrac{8}{3}$		
22.	4		
23.	$(f \circ f)(x) = \dfrac{1}{9}x - 4$		
24.	22		

25.	Yes, by Horizontal Line Test !	26.	No, by Horizontal Line Test !
27.	$(f \circ g)(x) = x$? Yes !	28.	$(g \circ f)(x) = x$? Yes !
29.	$f^{-1}(x) = \dfrac{x + 3}{2}$	30.	$f^{-1}(x) = \dfrac{2x + 1}{x - 1}$