

Student Name: KEY

Show all relevant work (use back of pages for scratch paper, if needed). **CIRCLE FINAL ANSWERS.** Leave answers exact (not decimals from a calculator). Each problem is worth 5 points.

1. Let $f(x) = \frac{\sqrt{x^2+4}}{x^2-x-6}$.

problems when
 $x^2-x-6=0$
 $(x-3)(x+2)=0$
 $x=3$ $x=-2$

Any number except
 -2 or 3

(a) What is the domain of f ?
 $\boxed{\{x \in \mathbb{R} \mid x \neq -2, x \neq 3\}}$

~~$(-\infty, -2)$~~
 $(-\infty, -2) \cup (-2, 3) \cup (3, +\infty)$

(b) Evaluate $f(0)$.

$$f(0) = \frac{\sqrt{0^2+4}}{0^2-0-6} = \frac{\sqrt{4}}{-6} = \frac{2}{-6} = \boxed{-\frac{1}{3}}$$

2. Given function $d(t) = 5 - 2t^2$ between $t = -2$ and $t = 7$,
 a b

(a) what is the net change of d ?

$$d(b) - d(a) = (5 - 2b^2) - (5 - 2a^2) = (5 - 2(7^2)) - (5 - 2(-2)^2)$$

$$= (5 - 2(49)) - (5 - 2(4)) = (5 - 98) - (5 - 8) = 5 - 98 - 5 + 8 = \boxed{-90}$$

(b) what is the average rate of change of d ?

$$\frac{d(b) - d(a)}{b - a} = \frac{-90}{7 - (-2)} = \frac{-90}{9} = \boxed{-10}$$

3. Let $h(x) = \begin{cases} 8 & \text{if } x \leq -3 \\ 7 - 3x & \text{if } x > -3 \end{cases}$

(a) Evaluate $h(8)$.

$$h(8) = 7 - 3(8) = 7 - 24 = \boxed{-17}$$

(b) Evaluate $h(-3)$.

$$h(-3) = \boxed{8}$$

4. A function g is described in words as: "Subtract 1 from the input, take the absolute value, then multiply by 2."

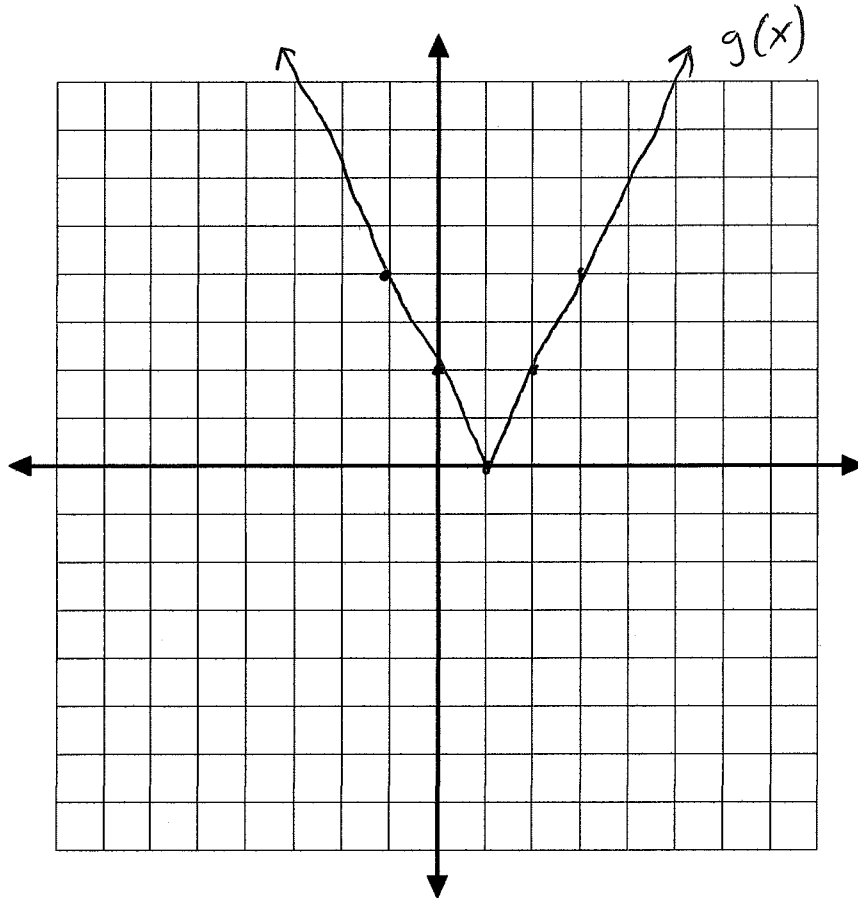
(a) Express function g algebraically.

$$g(x) = 2|x-1|$$

(b) Complete the chart of values for g :

x	$g(x)$
-1	4
0	2
1	0
2	2
3	4

(c) Plot the points and sketch the graph of g using the table from (b) as a guide.



5. If $f(x) = 7 - 2x$ and $g(x) = 1 + x^2$, find the following, and simplify :

(a) $(fg)(5) = f(5)g(5) = (7 - 2(5))(1 + 5^2) = (7 - 10)(1 + 25) = (-3)(26)$

$$= \boxed{-78}$$

(b) $(g - f)(a)$

$$= g(a) - f(a) = (1 + a^2) - (7 - 2a) = 1 + a^2 - 7 + 2a = \boxed{a^2 + 2a - 6}$$

(c) $(f \circ f)(-3)$

$$= f(f(-3)) = f(7 - 2(-3)) = f(7 - (-6)) = f(7 + 6) = f(13) = 7 - 2(13) = 7 - 26 = \boxed{-19}$$

(d) $f(g(4))$

$$f(g(4)) = f(1 + 4^2) = f(1 + 16) = f(17) = 7 - 2(17) = 7 - 34 = \boxed{-27}$$

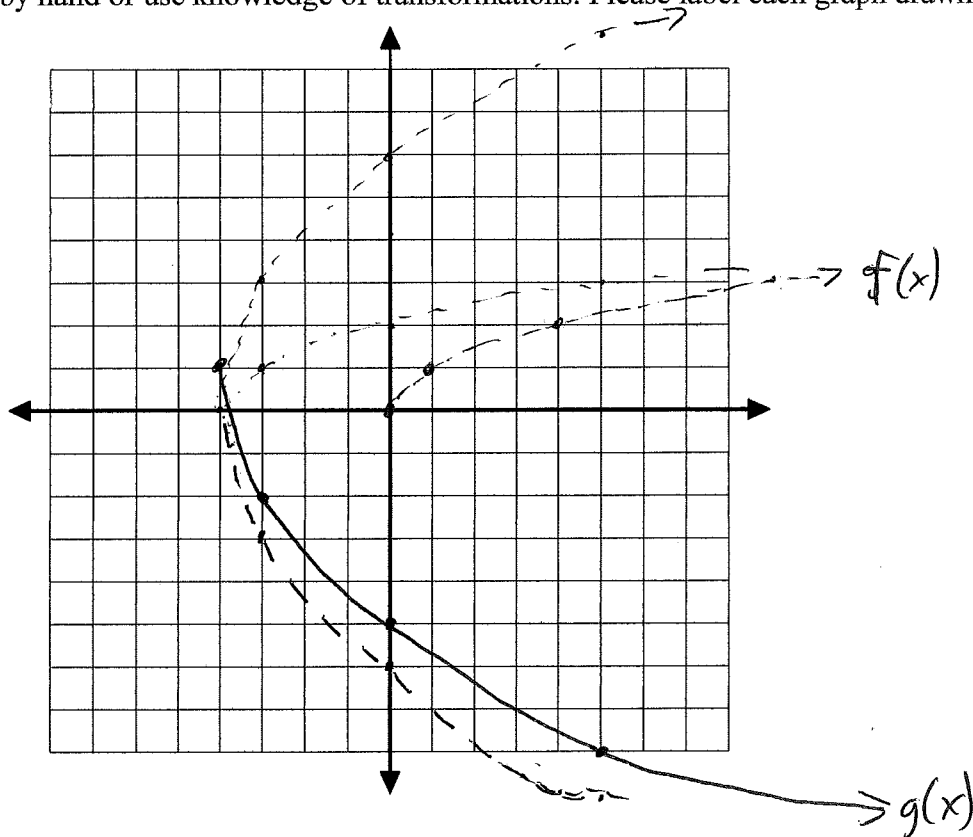
6. On the grid below sketch the graph of $f(x) = \sqrt{x}$.

Then, sketch the graph of $g(x) = 1 - 3\sqrt{x+4}$.

You may plot points by hand or use knowledge of transformations. Please label each graph drawn.

[5pts, each graph]

- $g(x)$
- left 4
 - stretch vertical $\times 3$
 - flip vertically
 - ~~up~~ up 1



7. In each part find f^{-1} .

(a) $f(x) = 7 + \sqrt[3]{2-5x}$

$$y = 7 + \sqrt[3]{2-5x}$$

$$x = 7 + \sqrt[3]{2-5y}$$

$$x-7 = \sqrt[3]{2-5y}$$

$$\rightarrow (x-7)^3 = 2-5y$$

$$(x-7)^3 - 2 = -5y$$

$$y = \frac{(x-7)^3 - 2}{-5} = \frac{2 - (x-7)^3}{5} = f^{-1}(x)$$

(b) $f(x) = \frac{3x-2}{x+5}$

$$y = \frac{3x-2}{x+5}$$

$$x = \frac{3y-2}{y+5}$$

$$x(y+5) = 3y-2$$

$$xy + 5x = 3y - 2$$

$$\rightarrow xy - 3y = -2 - 5x$$

$$y(x-3) = -2 - 5x$$

$$y = \frac{-(2+5x)}{x-3} = \frac{2+5x}{3-x} = f^{-1}(x)$$

8. A taxicab ride will cost you five dollars plus an additional twenty-five cents per minute driven.

(a) Construct a function, f , that models the cost of a taxicab ride that travels x number of minutes.

$$f(x) = 5 + 0.25x$$

(b) Calculate how much a 30 minute taxicab ride will cost you.

$$f(30) = 5 + 0.25(30) = 5 + 7.5 = \boxed{\$12.50}$$

(c) Determine $f^{-1}(x)$; that is, the inverse of the function from part (a).

$$y = 5 + 0.25x$$

$$x = 5 + 0.25y$$

$$\rightarrow x = 5 + \frac{y}{4}$$

$$x - 5 = \frac{y}{4}$$

$$y = 4(x-5) = f^{-1}(x)$$

(d) Calculate $f^{-1}(50)$. What does this represent?

$$f^{-1}(50) = 4(50-5) = 4(45) = 180$$

With \$50 you may take a 180 minute cab ride.