

Student Name: KEY

Show all relevant work (use back of pages for scratch paper, if needed). **CIRCLE FINAL ANSWERS.**
 Leave answers as fractions, not decimals. Each question is worth 5 points.

1. Let $f(x) = \frac{\sqrt{4-x}}{2x+3}$.

Domain: All numbers less than or equal to 4 except $-\frac{3}{2}$.
 $\{x \in \mathbb{R} \mid x \leq 4, x \neq -\frac{3}{2}\}$
 $(-\infty, -\frac{3}{2}) \cup (-\frac{3}{2}, 4]$

(a) What is the domain of f ?

For denominator when $2x+3=0$
 $2x = -3$
 $x = -\frac{3}{2}$

or $4-x < 0$
 $-x < -4$
 $x > 4$

(b) Evaluate $f(-5)$.

$$f(-5) = \frac{\sqrt{4-(-5)}}{2(-5)+3} = \frac{\sqrt{4+5}}{-10+3} = \frac{\sqrt{9}}{-7} = \boxed{-\frac{3}{7}}$$

2. Let $f(x) = \begin{cases} 2-x & \text{if } x \leq 0 \\ x^2+8 & \text{if } x > 0 \end{cases}$

(a) Evaluate $f(7)$. row 2

$$f(7) = 7^2 + 8 = 49 + 8 = \boxed{57}$$

(b) Evaluate $f(-2)$. row 1

$$f(-2) = 2 - (-2) = 2 + 2 = \boxed{4}$$

3. For the function $h(z) = 9 + z^3$ on the interval from $z = -1$ and $z = 2$,

(a) what is the net change?

$$f(b) - f(a) = f(2) - f(-1) = (9 + 2^3) - (9 + (-1)^3) = (9 + 8) - (9 - 1) = 17 - 8 = \boxed{9}$$

(b) what is the average rate of change?

$$\frac{f(b) - f(a)}{b - a} = \frac{9}{2 - (-1)} = \frac{9}{3} = \boxed{3}$$

4. A function g is described in words as: "Add 1 to the number, then take the square root."

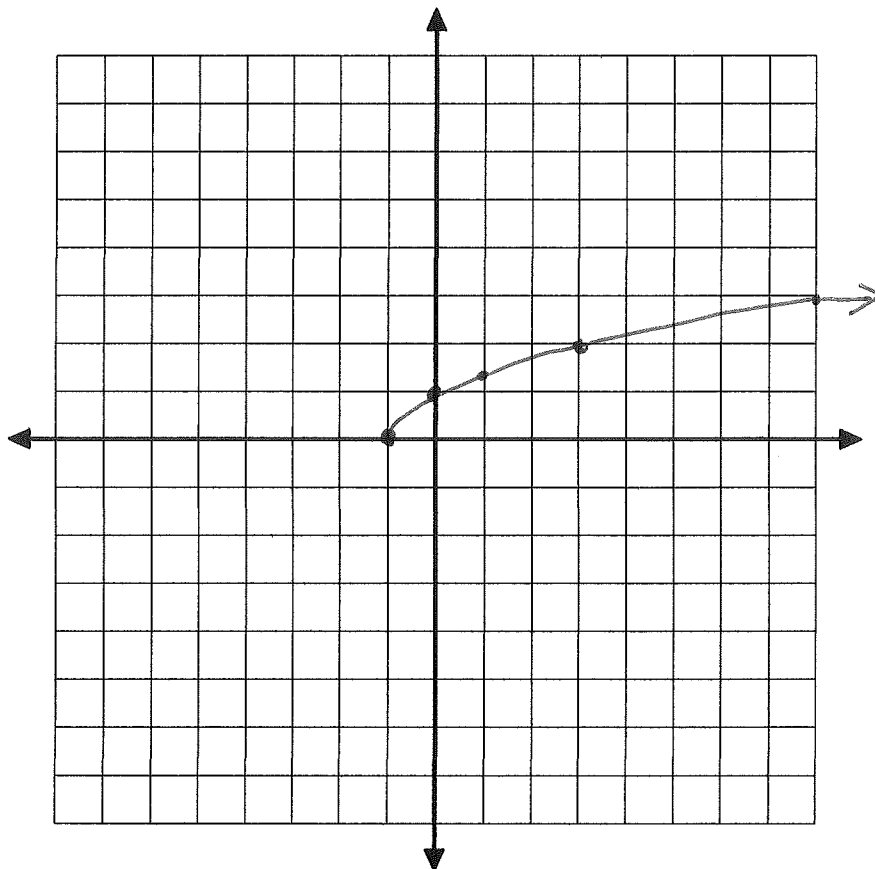
(a) Express function g algebraically.

$$g(x) = \sqrt{x+1}$$

(b) Complete the chart of values for g :

x	$g(x)$
-1	$\sqrt{0} = 0$
0	$= 1$
1	$\sqrt{2} \approx 1.4$
3	2
8	3

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



5. If $f(x) = x^2 - 5$ and $g(x) = 3x + 6$, find the following :

$$(a) (f+g)(8) = f(8) + g(8) = (8^2 - 5) + (3(8) + 6) = (64 - 5) + (24 + 6) \\ = 59 + 30 = \boxed{89}$$

$$(b) (g \circ f)(x) = g(f(x)) = g(x^2 - 5) = 3(x^2 - 5) + 6 = 3x^2 - 15 + 6 = \boxed{3x^2 - 9}$$

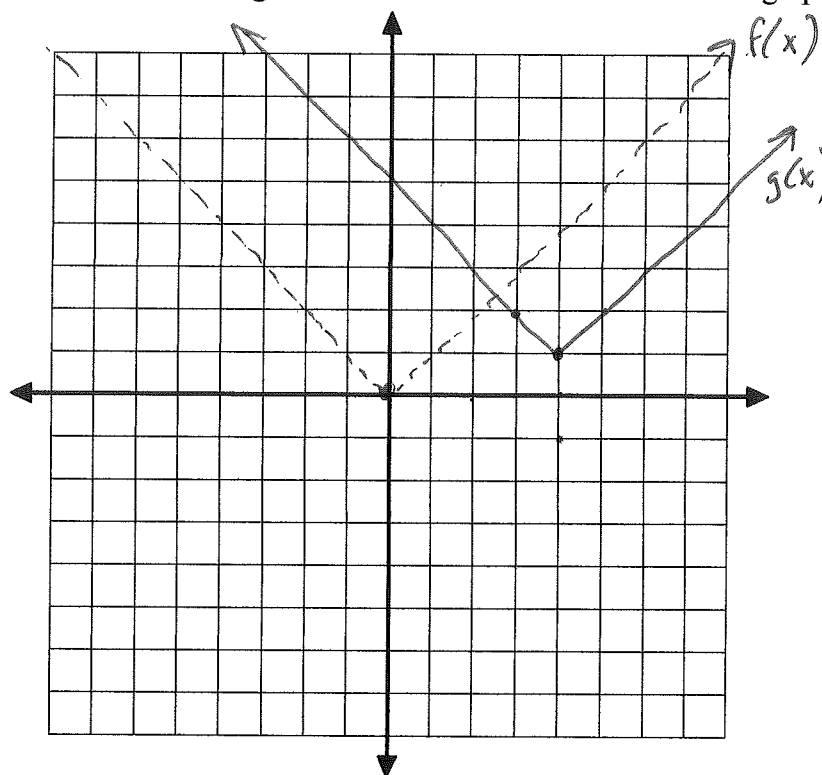
$$(c) (g-f)(x) = g(x) - f(x) = (3x + 6) - (x^2 - 5) = 3x + 6 - x^2 + 5 \\ = \boxed{-x^2 + 3x + 11}$$

$$(d) (fg)(2) = f(2)g(2) = (2^2 - 5)(3(2) + 6) \\ = (4 - 5)(6 + 6) = (-1)(12) = \boxed{-12}$$

(e) Is function f even, odd, or neither even nor odd?

$$f(-x) = (-x)^2 - 5 = x^2 - 5 = f(x) \quad \boxed{\text{EVEN}}$$

6. On the grid below sketch the graph of $f(x) = |x|$. Then, sketch the graph of $g(x) = |x - 4| + 1$. You may plot points by hand or use knowledge of transformations. Please label each graph drawn. [5pts, each graph]



$g(x)$
 • right 4
~~• down 1~~
 • up 1

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

(a) $f(x) = \frac{x}{5+3x}$

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

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

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

$$y = 5x + 3xy$$

$$y - 3xy = 5x$$

$$y(1-3x) = 5x$$

$$y = \frac{5x}{1-3x}$$

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

(b) $f(x) = \sqrt{5+x}$

$$y = \sqrt{5+x}$$

$$x = \sqrt{5+y}$$

$$x^2 = 5+y$$

$$y = x^2 - 5$$

$$f^{-1}(x) = x^2 - 5$$

8. A pizza parlor sells pizza by the slice for \$3.00 + \$0.50 per topping. The price can therefore be expressed as $p(x) = 3 + 0.5x$ where x is the number of toppings you want.

(a) How much would a slice of pizza cost if you got mushrooms, pepperoni, and onions on it?

$$p(3) = 3 + 0.5(3) = 3 + 1.5 = \boxed{\$4.50}$$

(b) Find $p^{-1}(x)$.

$$y = 3 + 0.5x$$

$$x = 3 + 0.5y$$

$$x - 3 = 0.5y$$

$$y = \frac{x-3}{0.5} = 2(x-3)$$

$$p^{-1}(x) = 2(x-3)$$

(c) Evaluate $p^{-1}(5)$. What does this evaluation demonstrate?

$$p^{-1}(5) = 2(5-3) = 2(2) = \boxed{4 \text{ toppings}}$$

With \$5.00 you may get a slice with 4 toppings.