

Directions: Show your work neatly and clearly. Answers without adequate justification will not receive full credit.

Solve each equation.

(8 pts) 1. $x = 1 + \frac{1}{x}$

$$x^2 = x + 1 \leftarrow -4$$

$$x^2 - x - 1 = 0$$

$$x = \frac{1 \pm \sqrt{1 - 4(1)(-1)}}{2}$$

$$x = \frac{1 \pm \sqrt{5}}{2}$$

(8 pts) 2. $x^2 - 6x = 11$

$$x^2 - 6x - 11 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(-11)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{80}}{2} \leftarrow -3$$

$$= \frac{6 \pm 4\sqrt{5}}{2}$$

$$= 3 \pm 2\sqrt{5}$$

7.47 -1.47 decimal answers

Find the inverse function for each function.

(8 pts) 3. $y = 4x - 1$

Inverse $x = 4y - 1$

$$4y = x + 1$$

$$y = \frac{x+1}{4}$$

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

$y = \frac{2x+1}{x-3}$ function

$x = \frac{2y+1}{y-3}$ inverse

$$xy - 3x = 2y + 1$$

$$xy - 2y = 3x + 1$$

$$y(x-2) = 3x+1$$

$$y = \frac{3x+1}{x-2}$$

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

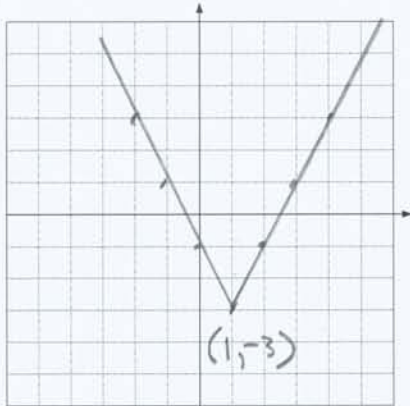
Scale

90 A - 3
80 B - 6
60 C - 8
50 D - 5
↓ F - 7

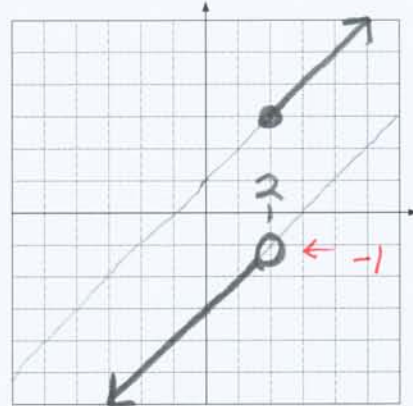
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(8 pts) 5. a. Graph $y = 2|x-1| - 3$

b. State the domain.



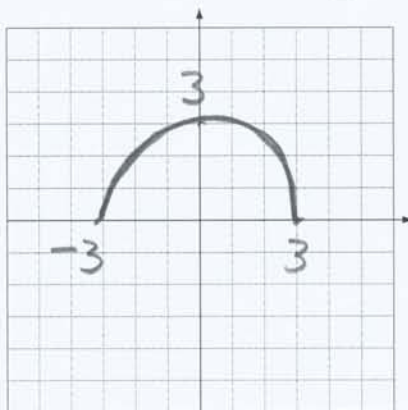
(8 pts) 6. Graph $f(x) = \begin{cases} x+1, & x \geq 2 \\ x-3, & x < 2 \end{cases}$



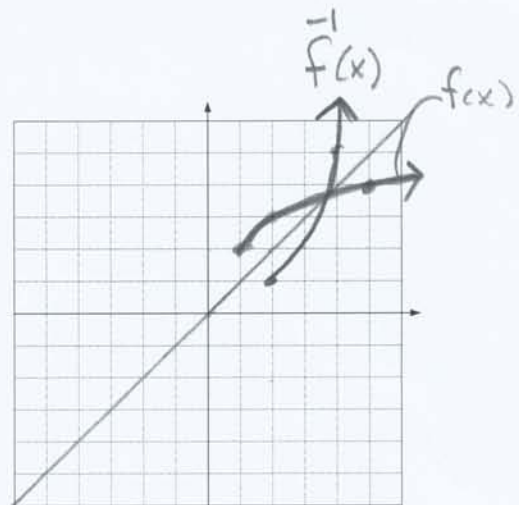
(8 pts) 7. a. Graph $f(x) = \sqrt{9-x^2}$

b. State the range.

Range = $[0, 3]$



(8 pts) 8. Graph $f(x) = 2 + \sqrt{x-1}$ and its inverse on the grid below. Include the graph of $y = x$



9. Let $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{x}$, and find

(4 pts) a. $(f-g)(4)$

$$\begin{aligned} &= f(4) - g(4) \\ &= 2 - \frac{1}{4} \\ &= \boxed{\frac{7}{4}} \end{aligned}$$

(4 pts) b. $\frac{f}{g}(4)$

$$\begin{aligned} &= \frac{f(4)}{g(4)} \\ &= \frac{2}{\frac{1}{4}} \\ &= \boxed{8} \end{aligned}$$

(4 pts) c. $(g \circ f)(x)$

$$\begin{aligned} &= g(f(x)) \\ &= g(\sqrt{x}) \\ &= \frac{1}{\sqrt{x}} \end{aligned}$$

(4 pts) d. What is the domain of $g \circ f$?

$$\begin{aligned} &(0, \infty) \\ &\text{or} \\ &\{x \mid x > 0\} \end{aligned}$$

10. Let $f(x) = 3x^2 - x$.

(5 pts) a. Find $f(x+1)$

$$\begin{aligned} &= 3(x+1)^2 - (x+1) \leftarrow -2 \\ &= 3(x^2 + 2x + 1) - x - 1 \\ &= 3x^2 + 6x + 3 - x - 1 \\ &= \boxed{3x^2 + 5x + 2} \end{aligned}$$

4 - 1

(5 pts) b. Find x if $f(x) = 10$

$$\begin{aligned} &3x^2 - x = 10 \\ &3x^2 - x - 10 = 0 \leftarrow \text{to here } -2 \\ &(3x + 5)(x - 2) = 0 \\ &\boxed{x = -\frac{5}{3}, x = 2} \end{aligned}$$

11. A ball is kicked straight up into the air with an initial velocity of 128 ft/sec from 5 ft above the ground. It's height above the ground after it is kicked is a function of time t :

$$\text{Height} = h(t) = -16t^2 + 128t + 5$$

- (5 pts) a. Find the time it reaches it's maximum height. Be sure to include the units with your answer.

$$\text{max height when } t = -\frac{b}{2a} = \frac{-128}{2(-16)} = \boxed{4 \text{ seconds}}$$

- (5 pts) b. Find it's maximum height. Be sure to include the units with your answer.

$$\begin{aligned} \text{max height is } h(4) &= -16(16) + 128(4) + 5 \\ &= \boxed{261 \text{ feet}} \end{aligned}$$

12. For 5 points extra credit, use Pascal's triangle to expand $(a+b)^7$. There is no partial credit on this problem.

$$(a+b)^7 = a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + b^7$$

1							
1	1						
1	2	1					
1	3	3	1				
1	4	6	4	1			
1	5	10	10	5	1		
1	6	15	20	15	6	1	
1	7	21	35	35	21	7	1