Intro to Functions and Rates of Change

1. Determine the domain and range for each function listed below:

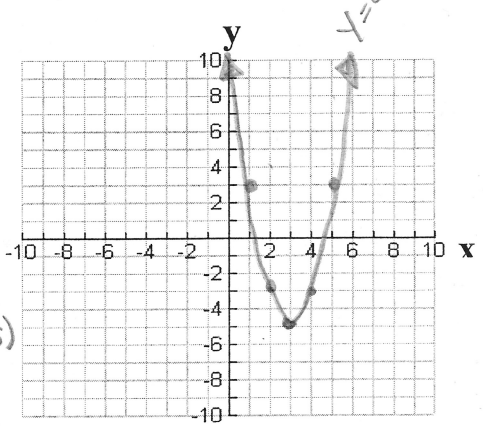
   a) $x^2 + y^2 = 81$ b) $y = \dfrac{1}{x-3}$ c) $y = 2(5)^t$

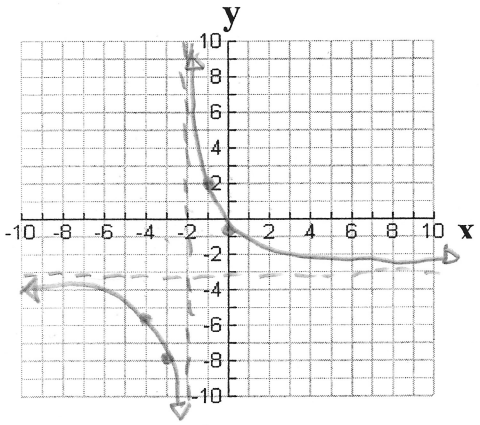
2. Determine if each function is even, odd or neither.

   a) $y = x^2 - 3$ b) $y = 2^x$ c) $y = \cos\left(\theta - \dfrac{\pi}{2}\right)$

3. Graph the following functions below and complete the table.

   a) $y = 2(x-3)^2 - 5$ b) $y = \dfrac{5}{x+2} - 3$





Domain	
Range	
Intervals of Increase	
Intervals of Decrease	
Discontinuities	
x-intercepts	
y-intercepts	
symmetry	
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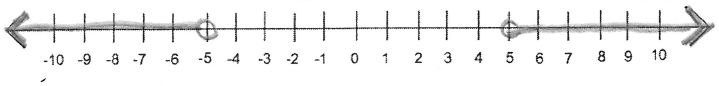
4. Determine the inverse of each function below:

   a) $y = \sqrt{x-4} + 2$ b) $y = 2x - 8$ c) $y = 3(x-2)^2 - 5$

5. For the function $f(x) = 3x^2 - 2x + 8$, determine:
   a) The instantaneous rate of change at x = 5.
   b) The average rate of change from x = 5 to x = 10.

6. Highlight the portion of a numberline represented by the equation |x|>5.



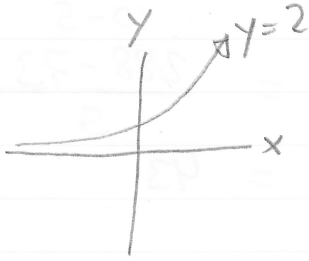
Unit 1 Solutions
Review

1a) circle with radius 9
Domain = $\{x \in \mathbb{R} \mid -9 \le x \le 9\}$
Range = $\{y \in \mathbb{R} \mid -9 \le y \le 9\}$

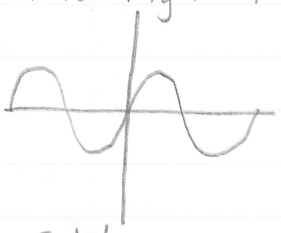
b) $y = \frac{1}{x}$ shifted right 3 units
Domain = $\{x \in \mathbb{R} \mid x \neq 3\}$
Range = $\{y \in \mathbb{R} \mid y \neq 0\}$

c) $y = 2(5)^t$ ← exponential growth
Domain = $\{x \in \mathbb{R}\}$
Range = $\{y \in \mathbb{R} \mid y > 0\}$

2a) $f(-x) = (-x)^2 - 3$
$= (-1)^2 x^2 - 3$
$= x^2 - 3$
$= f(x)$
Since $f(-x) = f(x)$ it is even

b) 

Neither

c) cosine curve shifted right 90°

Odd
$f(-x) = -F(x)$

3. On previous sheet

4a) $y = \sqrt{x-4} + 2$
$x = \sqrt{y-4} + 2$
$(x-2)^2 = (\sqrt{y-4})^2$
$(x-2)^2 = y - 4$
$y = (x-2)^2 + 4$, $x \ge 2$
single arm can't turn into double arm
needs restriction;

b) $y = 2x - 8$
$x = 2y - 8$
$x + 8 = 2y$
$y = \frac{x+8}{2}$

c) $y = 3(x-2)^2 - 5$
$x = 3(y-2)^2 - 5$
$x + 5 = 3(y-2)^2$
$\pm\sqrt{\frac{x+5}{3}} = \sqrt{(y-2)^2}$
$y - 2 = \pm\sqrt{\frac{x+5}{3}}$
$y = \pm\sqrt{\frac{x+5}{3}} + 2$

5a) $IROC = \frac{F(5.01) - F(5)}{0.01}$

$= \frac{(3(5.01)^2 - 2(5.01) + 8) - (3(5)^2 - 2(5) + 8)}{0.01}$

$= \frac{73.2803 - 73}{0.01}$

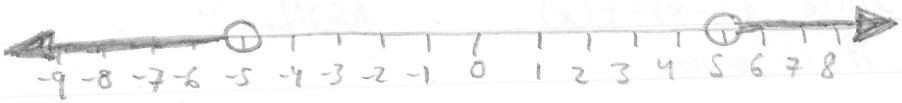
$= 28.03$

b) $AROC = \frac{F(10) - F(5)}{10 - 5}$

$= \frac{288 - 73}{5}$

$= 43$

6.



Rough Work for #3,

a) **x-int (y=0)**

$0 = 2(x-3)^2 - 5$

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

$(x-3)^2 = \frac{5}{2}$

$x - 3 = \pm\sqrt{\frac{5}{2}}$

x-ints $= \pm\sqrt{\frac{5}{2}} + 3$

y-int (x=0)

$y = 2(0-3)^2 - 5$

y-int $= 13$

b) **x-int (y=0)**

$0 = \frac{5}{x+2} - 3$

$\frac{5}{x+2} = \frac{3}{1}$

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

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

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

$x = \frac{5}{3} - \frac{6}{3}$

x-int $= -\frac{1}{3}$

y-int (x=0)

$y = \frac{5}{0+2} - 3$

$= \frac{5}{2} - \frac{6}{2}$

y-int $= -\frac{1}{2}$