Unit 1 HW 2

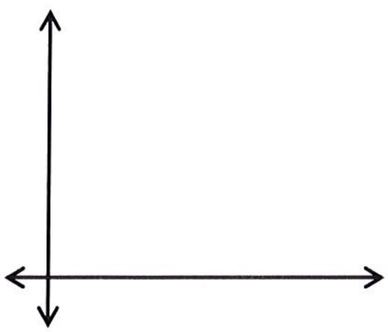
1. $g(x) = x^2 + x$

a. Find the instantaneous ROC at $x = 2$.

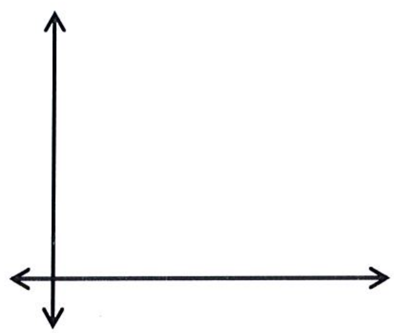
b. Find average ROC over the interval $[-1, 3]$

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

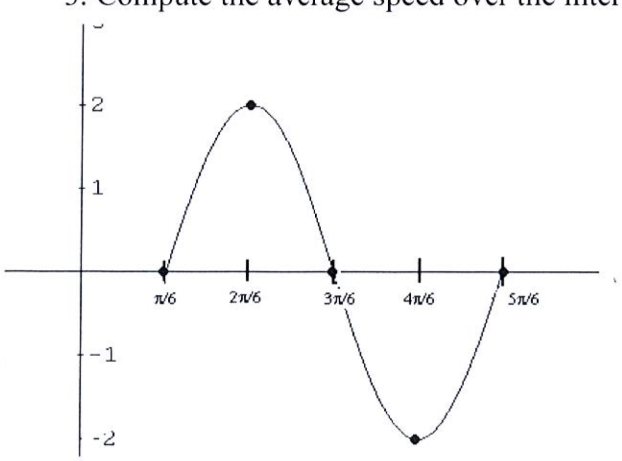
a. Find the slope of the secant line from $x = 2$ to $x = 5$; graph to represent.



b. Find the slope of the tangent line at $x = 3$; graph to represent.



3. Compute the average speed over the interval $\left[\frac{\pi}{6}, \frac{\pi}{2}\right]$



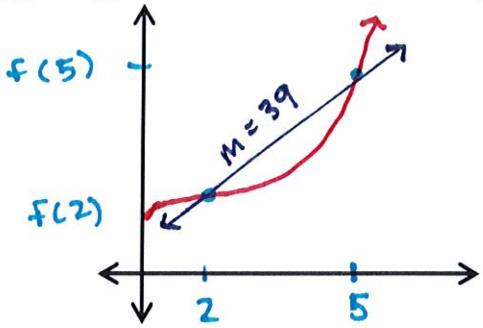
4. Find the slope at $x = 4$ of the function

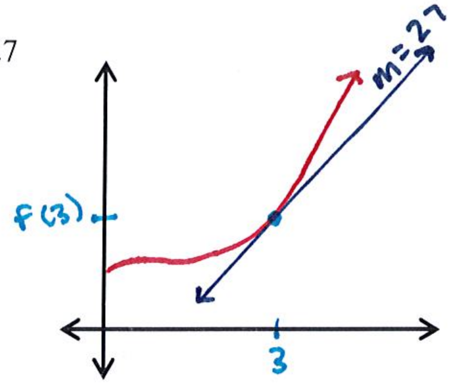
$y = \sqrt{x}$

Answers

1a. 5 b. 3

2a. 39 b. 27





*graphs are not perfect

3. 0

4. ¼

1. $g(x) = x^2 + x$

a. Find the instantaneous ROC at $x = 2$.

$\lim_{h\to0} \frac{g(2+h) - g(2)}{h}$

$= \frac{(2+h)^2 + (2+h) - 6}{h} = \frac{4+4h+h^2+2+h-6}{h}$

$= \frac{6+5h+h^2-6}{h} = \frac{5h+h^2}{h} = \frac{h(5+h)}{h}$

$= \lim_{h\to0} 5+0 = \boxed{5}$

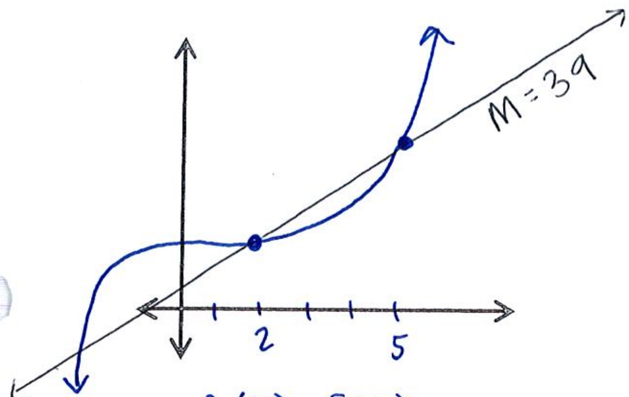
b. Find average ROC over the interval $[-1,3]$

$= \frac{g(3) - g(-1)}{3-(-1)}$

$= \frac{(12) - (0)}{4} = \boxed{3}$

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

a. Find the slope of the secant line from $x = 2$ to $x = 5$; graph to represent.

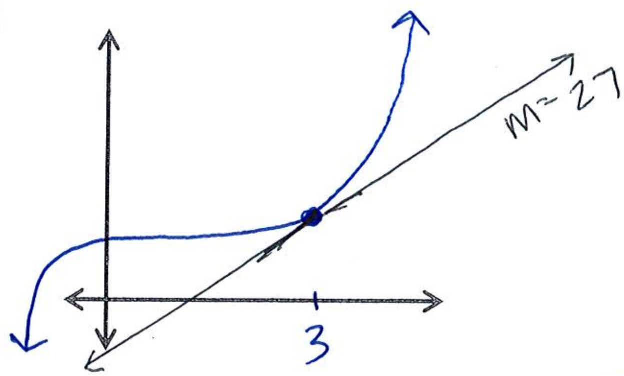


$= \frac{f(5) - f(2)}{5-2}$

$= \frac{126-9}{3} = \frac{117}{3}$

$= \boxed{39}$

b. Find the slope of the tangent line at $x = 3$; graph to represent.



$\lim_{h\to0} \frac{f(3+h) - f(3)}{h} = \frac{(3+h)^3 + 1 - 28}{h}$

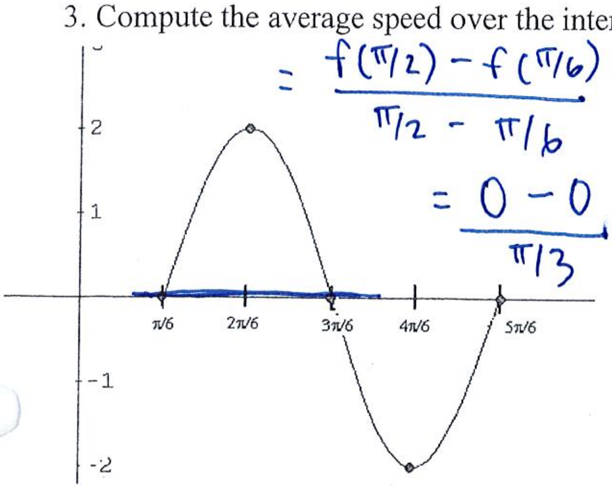
$= \frac{h^3 + 9h^2 + 27h + 27 + 1 - 28}{h}$

$= \frac{h^3 + 9h^2 + 27h}{h} = \lim_{h\to0} h^2 + 9h + 27$

$= 0^2 + 9(0) + 27$

$= \boxed{27}$

3. Compute the average speed over the interval $[\pi/6, \pi/2]$



$= \frac{f(\pi/2) - f(\pi/6)}{\pi/2 - \pi/6}$

$= \frac{0-0}{\pi/3} = \boxed{0}$

4. Find the slope at $x = 4$ of the function

$y = \sqrt{x}$

$\lim_{h\to0} \frac{f(4+h) - f(4)}{h}$

$= \frac{\sqrt{4+h} - 2}{h} \cdot \frac{\sqrt{4+h} + 2}{\sqrt{4+h} + 2}$

$= \frac{4+h-4}{h(\sqrt{4+h}+2)} = \frac{h}{h(\sqrt{4+h}+2)} = \frac{1}{\sqrt{4+h}+2}$

$\lim_{h\to0} \frac{1}{\sqrt{4+0}+2} = \frac{1}{\sqrt{4}+2} = \boxed{\frac{1}{4}}$