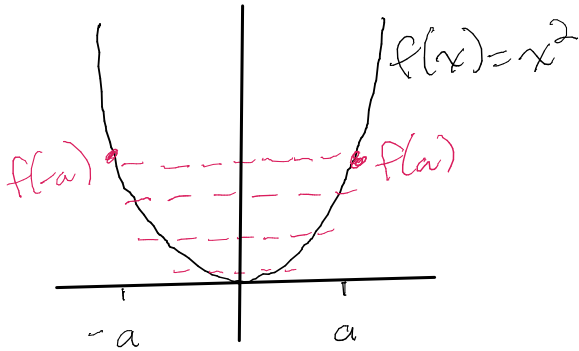


Section 2.1

#1



$$\frac{f(a) - f(-a)}{a - (-a)} = \frac{a^2 - (-a)^2}{2a} = \frac{a^2 - a^2}{2a} = \frac{0}{2a} = 0$$

SLOPE OF ALL SECANT LINES $[a, a]$ IS ZERO,
SO THE SLOPE OF THE TANGENT LINE AT $x=0$ IS
ALSO ZERO.

#2

a
$$\frac{s(3) - s(0)}{3 - 0} = \frac{65.9 - 20}{3} = \frac{45.9}{3} = 15.3$$

b
$$\frac{s(2) - s(0)}{2 - 0} = \frac{60.4 - 20}{2} = \frac{40.4}{2} = 20.2$$

c
$$\frac{s(1) - s(0)}{1 - 0} = \frac{45.1 - 20}{1} = \frac{25.1}{1} = 25.1$$

d
$$\begin{aligned} \frac{s(h) - s(0)}{h - 0} &= \frac{-4.9h^2 + 30h + 20 - 20}{h} = \frac{-4.9h^2 + 30h}{h} \\ &= -4.9h + 30 \end{aligned}$$

#3

$$\frac{s(\pi) - s(\pi/2)}{\pi - \pi/2} = -1.9098593171$$

$$\frac{s(\pi/2 + 0.1) - s(\pi/2)}{(\pi/2 + 0.1) - (\pi/2)} = -0.1498750417$$

$$\frac{s(\pi/2 + 0.01) - s(\pi/2)}{(\pi/2 + 0.01) - (\pi/2)} = -0.014999875$$

$$\frac{s(\pi/2 + 0.001) - s(\pi/2)}{(\pi/2 + 0.001) - (\pi/2)} = -0.0015$$

$$\frac{s(\pi/2 + 0.0001) - s(\pi/2)}{(\pi/2 + 0.0001) - (\pi/2)} = -0.00015$$

SLOPE TENDS TOWARD ZERO AS INTERVAL GETS SMALLER, SO SLOPE AT $t = \pi/2$ IS 0.

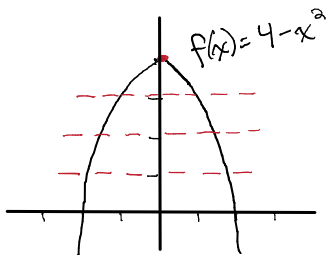
#4

INTERVAL	SLOPE OF SECANT LINE
$[1, 2]$	4
$[1, 1.1]$	2.31
$[1, 1.01]$	2.0301
$[1, 1.001]$	2.003001
$[1, 1.0001]$	2.00030001

SLOPE TENDS TOWARD 2 AS THE INTERVAL GETS SMALLER, SO SLOPE AT $x=1$ IS 2.

#5

a



b From RESULTS IN #1, TANGENT LINE HAS ZERO SLOPE AT PARABOLA VERTEX. HENCE $a=0$, so $(a, f(a)) = (0, 4)$.

c

$$\begin{aligned} \text{SINCE } a=0, \\ \frac{f(a+h) - f(a-h)}{(a+h) - (a-h)} &= \frac{f(0+h) - f(0-h)}{(0+h) - (0-h)} \\ &= \frac{f(h) - f(-h)}{h+h} \\ &= \frac{4-h^2 - 4+h^2}{2h} = \frac{0}{2h} = 0 \end{aligned}$$

SO THE SLOPE OF THE SECANT LINE BETWEEN $(a+h, f(a+h))$ AND $(a-h, f(a-h))$ IS ALWAYS ZERO.

#6

a $s(t) = 16 \text{ (ft/s}^2\text{)} t^2 = 96 \text{ ft}$
 $\Rightarrow t^2 = 6 \text{ s}^2$
 $\Rightarrow t = \pm \sqrt{6} \text{ s}$

SINCE $-\sqrt{6} \text{ s}$ DOESN'T MAKE ANY SENSE,
THE ROCK TAKES $\sqrt{6} \text{ s}$ TO REACH THE WATER.

b

TIME INTERVAL	AVERAGE VELOCITY (m/s)
$[\sqrt{6}, 2\sqrt{6}]$	117.57551
$[\sqrt{6}, \sqrt{6} + 0.1]$	79.98367
$[\sqrt{6}, \sqrt{6} + 0.01]$	78.54367
$[\sqrt{6}, \sqrt{6} + 0.001]$	78.39967
$[\sqrt{6}, \sqrt{6} + 0.0001]$	78.38527

THE AVERAGE VELOCITY TENDS TOWARD
 78.383 (OR $32\sqrt{6}$) ft/s .