1. $P(3,10)$

Q	Slope of $\overline{PQ}$
$(6,18)$	$m_{\overline{PQ}} = \dfrac{18-10}{6-3} \approx 2.666666667$
$(5,15)$	$m_{\overline{PQ}} = \dfrac{15-10}{5-3} = \dfrac{5}{2} = 2.5$
$(4,12.3)$	$m_{\overline{PQ}} = \dfrac{12.3-10}{4-3} = 2.3$
$(3.5,11.1)$	$m_{\overline{PQ}} = \dfrac{11.1-10}{3.5-3} = 2.2$
$(3.1,10.21)$	$m_{\overline{PQ}} = \dfrac{10.21-10}{3.1-3} = 2.1$

2. The slope of the tangent line appears to be 2

3. $P(1,5)$ $\quad f(x) = 6x - x^2$

$Q(x, 6x-x^2)$

$m_{\overline{PQ}} = \dfrac{6x-x^2-5}{x-1}$ $\qquad$ let $g(x) = \dfrac{6x-x^2-5}{x-1}$

x	$m_{PQ} = \dfrac{6x-x^2-5}{x-1}$
3	$g(3) = 2$
2	$g(2) = 3$
1.5	$g(1.5) = 3.5$
1.01	$g(1.01) = 3.99$

4. The slope of the tangent line appears to be 4

5. $P(1,5)$ $m=4$

$y-5=4(x-1)$

$y=4x+1$

6. (a) $f(2)=10$ ft
$f(4)=28$ ft

(b) avg vel for $[2,4]$ $= \dfrac{f(4)-f(2)}{4-2} = 9$ ft/sec

(c)

interval	avg vel (ft/sec)
$[1.9,2]$	$\dfrac{f(2)-f(1.9)}{2-1.9}=6.9$
$[1.99,2]$	$\dfrac{f(2)-f(1.99)}{2-1.99}=6.99$
$[1.999,2]$	$\dfrac{f(2)-f(1.999)}{2-1.999}=6.999$
$[2,2.1]$	$\dfrac{f(2.1)-f(2)}{2.1-2}=7.1$
$[2,2.01]$	$\dfrac{f(2.01)-f(2)}{2.01-2}=7.01$
$[2,2.001]$	$\dfrac{f(2.001)-f(2)}{2.001-2}=7.001$

The instantaneous velocity when $t=2$ sec appears to be 7 ft/sec

8. (a)

interval	avg vel (m/sec)
[1,4]	$\frac{24-4}{4-1} = \frac{20}{3}$
[1,3]	$\frac{16-4}{3-1} = 6$
[1,2]	$\frac{9-4}{2-1} = 5$
[0,1]	$\frac{4-0}{1-0} = 4$

(b) average velocity for [0,1] is 4 m/sec and the average velocity for [1,2] is 5 m/sec. We will average these 2 average velocities to estimate the instantaneous velocity when t=1 sec.

$$\frac{4+5}{2} = 4.5$$

Instantaneous velocity when t=1 sec is about 4.5 m/sec

18 $\lim\limits_{x \to -1} \dfrac{x^2-2x}{x^2-x-2}$

Let $f(x) = \dfrac{x^2-2x}{x^2-x-2}$

x	$f(x)$
0	$f(0) = 0$
-0.5	$f(-0.5) = -1$
-0.9	$f(-0.9) = -9$
-0.95	$f(-0.95) = -19$
-0.99	$f(-0.99) = -99$
-0.999	$f(-0.999) = -999$
-2	$f(-2) = 2$
-1.5	$f(-1.5) = 3$
-1.1	$f(-1.1) = 11$
-1.01	$f(-1.01) = 101$
-1.001	$f(-1.001) = 1001$

$\lim\limits_{x \to -1^-} f(x) = \infty$ and $\lim\limits_{x \to -1^+} f(x) = \infty$

So $\lim\limits_{x \to -1} f(x)$ DNE since $\lim\limits_{x \to -1^-} f(x) \neq \lim\limits_{x \to -1^+} f(x)$

24. $\lim\limits_{x \to 0} \dfrac{9^x - 5^x}{x}$ Let $f(x) = \dfrac{9^x - 5^x}{x}$

x	$f(x)$
-0.1	$f(-0.1) \approx 0.4859836076$
-0.01	$f(-0.01) \approx 0.5767057634$
-0.001	$f(-0.001) \approx 0.5866689846$
0.1	$f(0.1) \approx 0.7111199653$
0.01	$f(0.01) \approx 0.5990822011$
0.001	$f(0.001) \approx 0.5889$ [illegible]

$\lim\limits_{x \to 0} f(x) = 0.59$