1. $y = x^2$

$(3, 9)$

(x, y), $x = 2.97$, $x = 3.001$, $x = 3+h$

$$m = \frac{y-9}{x-3}$$

$y = (2.97)^2$
$\shortparallel$
$y = 8.8209$

$y = (3.001)^2$

$y = 9.006$

$y = (3+h)^2$

$y = (3+h)(3+h)$
$9 + 3h + 3h + h^2$
$\shortparallel$
$y = h^2 + 6h + 9$

$$m = \frac{8.8209 - 9}{2.97 - 3} = \frac{-0.1791}{-0.03} = \boxed{m = 5.97}$$

$$m = \frac{9.006 - 9}{3.001 - 3} = \frac{0.006001}{0.001} = \boxed{m = 6.001}$$

$$m = \frac{h^2 + 6h + 9 - 9}{3 + h - 3} = \frac{h^2 + 6h}{h} = \frac{\cancel{h}(h+6)}{\cancel{h}} = \boxed{m = 6 + h}$$

$h = 0.001$

$$m = 6 + 0.001 = \boxed{m = 6.001}$$

When h is very small, m gets closer to 6.

3. $y = x^2 + x - 2$

$(2, 4)\ (x, y)$

$x = 1.99$

$y = (1.99)^2 + 1.99 - 2$

$y = 3.9501$

$x = 2.004$

$y = (2.004)^2 + 2.004 - 2$

$y = 4.02002$

$x = 2 + h$

$y = (2+h)^2 + 2 + h - 2$

$(2+h)(2+h)$

$4 + 2h + 2h + h^2$

$h^2 + 4h + 4$

$h^2 + 4h + 4 + 2 + h - 2$

$h^2 + 4h + h + 4 + 2 - 2$

$y = h^2 + 5h + 4$

$m = \dfrac{y - 4}{x - 2}$

$y = 3.9501$

$y = 4.02002$

$m = \dfrac{3.9501 - 4}{1.99 - 2}$

$m = \dfrac{-0.0499}{-0.01}$

$\boxed{m = 4.99}$

$m = \dfrac{4.02002 - 4}{2.004 - 2}$

$\dfrac{0.02002}{0.004}$

$\boxed{m = 5.005}$

3 (Cont)

$y = h^2 + 5h + 4$

$$m = \frac{h^2 + 5h + 4 - 4}{2 + h - 2}$$

$$= \frac{h^2 + 5h}{h}$$

$$= \frac{h(h+5)}{h}$$

$$= \boxed{m = 5 + h} \rightarrow m = 5 + 0.001$$

$h = 0.001$

$$= \boxed{m = 5.001}$$

When h is very small
m gets closer to 5

5a. $\frac{\Delta y}{\Delta x} = \frac{f(b) - f(a)}{b - a}$ [9 am, 1 pm] $a = 9,\ b = 1$

$\underset{f(b)}{f(1)} = 80$, $\underset{f(a)}{f(9)} = 60.25$

$$= \frac{80 - 60.25}{1\,pm - 9\,am}$$

$$= \frac{19.75}{4\ hours}$$

$$= 4.9°$$

5b. Speed of temperature at 10 am

Tangent Line Points: (9:30am, 65) (10 am, 67)
for 10am

Slope of Tangent Line $= \dfrac{67-65}{.5}$

$= 4°$

Speed of temperature at 7 pm

Tangent line Points: (6:30pm, 75) (7pm, 70)

Slope of Tangent Line $= \dfrac{70-75}{.5} = \dfrac{-5}{.5} = -10°$

7a. $[0, 20]$

$a = 0,\ b = 20$

$f(a) = f(0) = 0$

$f(b) = f(20) = 300$

$\dfrac{300-0}{20-0} = \dfrac{30\cancel{0}}{2\cancel{0}} = \boxed{15 \text{ ft/sec}}$

7b. $[10, 30]$

$a = 10,\ b = 30$

$f(a) = f(10) = 200$

$f(b) = f(30) = 100$

$\dfrac{100-200}{30-10} = \dfrac{-10\cancel{0}}{2\cancel{0}} = -5 \text{ ft/sec}$

7b. Speed of Car at $t=10$

y increment $= 1/20 = 20$ units
x increment $=$ 1 unit

Tangent Points: $(10, 200)\ (11, 235)$

$$\frac{235-200}{11-10}$$

$$\frac{35}{1}$$

$$=$$

35 ft/sec

$t=20$

Tangent Points: $(20, 300)\ (19, 301)$

$$\frac{301-300}{19-20}$$

$$=$$

$$\frac{1}{-1}$$

$$=$$

-1 ft/sec

$t=30$

Tangent Points: $(30, 100)\ (29, 140)$

$$\frac{140-100}{29-30}$$

$$=$$

$$\frac{40}{-1}$$

$$=$$

-40 ft/sec

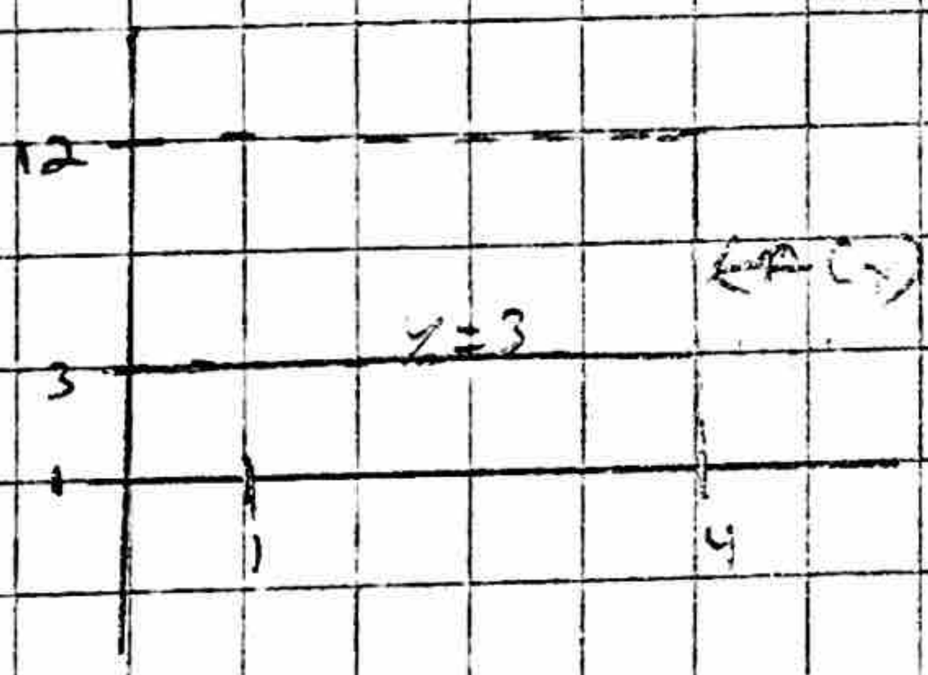
9. Area = Base x Height

$A = BH$

9a. $A(0) = 0 \cdot 3 = 0$ $\quad A(1) = 1 \cdot 3 = 3$ $\quad A(2) = 2 \cdot 3 = 6$ $\quad A(2.5) = 2.5 \times 3 = 7.5$ $\quad A(3) = 3 \cdot 3 = 9$

9b. $A(4) - A(1) = 12 - 0 = 12$

$A(4) = 4 \cdot 3 = 12$ $\quad A(1) = 0 \cdot 3 = 0$



9c. (A(x) for $0 \leq x \leq 4$