hw solutions
section 2.6

3. see graph on pg 145
find the slopes at 4pm & 11pm

4pm $\Rightarrow$ $t = 10$
slope $= \frac{12.3}{4} = 3.075$

11pm $\Rightarrow$ $t = 17$
slope $= \frac{-42.3}{2} = -21.15$

12. Use the 4-step process to find f'
$f(x) = 8 - 4x$

$f(x+h) = 8 - 4(x+h) = 8 - 4x - 4h$

$f(x+h) - f(x) = 8 - 4x - 4h - (8 - 4x) = -4h$

$\frac{f(x+h) - f(x)}{h} = \frac{-4h}{h} = -4$

$f'(x) = \lim_{h \to 0} -4 = -4$

26. $f(x) = \frac{1}{x-1}$

(a) find $f'(x)$

$f(x+h) = \frac{1}{x+h-1}$

$f(x+h) - f(x) = \frac{1}{x+h-1} - \frac{1}{x-1}$

$= \frac{(x-1) - (x+h-1)}{(x-1)(x+h-1)} = \frac{-h}{(x-1)(x+h-1)}$

$\frac{f(x+h) - f(x)}{h} = \frac{-h}{(x-1)(x+h-1)} \cdot \frac{1}{h} = \frac{-1}{(x-1)(x+h-1)}$

$f'(x) = \lim_{h \to 0} \frac{-1}{(x-1)(x+h-1)} = \frac{-1}{(x-1)^2}$

(b) Find the tangent line at $(-1, -\frac{1}{2})$

$m = f'(-1) = \frac{-1}{(-2)^2} = -\frac{1}{4}$

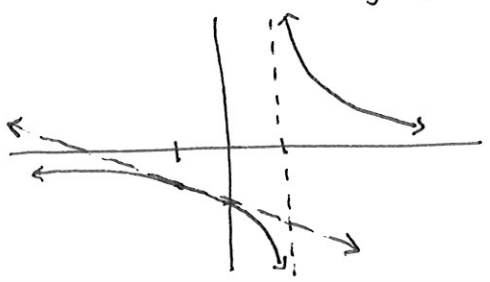
$y = mx + b$

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

$b = -\frac{1}{2} - \frac{1}{4} = -\frac{3}{4}$

$y = -\frac{1}{4}x - \frac{3}{4}$

(c) sketch f & the tangent line



9. Use the 4-step process to find f'
$f(x) = 13$

$f(x+h) = 13$

$f(x+h) - f(x) = 13 - 13 = 0$

$\frac{f(x+h) - f(x)}{h} = \frac{0}{h} = 0$

$f'(x) = \lim_{h \to 0} 0 = 0$

19. find $f'(1)$ and the tangent line thru $(1, 3)$
$f(x) = 3x^2$

$f(x+h) = 3(x+h)^2 = 3x^2 + 6xh + 3h^2$

$f(x+h) - f(x) = 6xh + 3h^2$

$\frac{f(x+h) - f(x)}{h} = \frac{6xh + 3h^2}{h} = 6x + 3h$

$f'(x) = \lim_{h \to 0} (6x + 3h) = 6x$

$f'(1) = 6(1) = 6$

tangent line:
$m = 6$ & $(1, 3)$

$y = 6x + b$

$3 = 6(1) + b \Rightarrow b = -3$

$y = 6x - 3$