hw solutions
section 3.1

2. $f(x) = 365$

$f'(x) = 0$

4. $f(x) = x^7$

$f'(x) = 7x^6$

14. $f(u) = 2/\sqrt{u} = 2u^{-1/2}$

$f'(u) = -u^{-3/2}$

24. $f(x) = \dfrac{x^3+2x^2+x-1}{x}$

$f(x) = x^2+2x+1-x^{-1}$

$f'(x) = 2x+2+x^{-2}$

29. $f(t) = \dfrac{4}{t^4} - \dfrac{3}{t^3} + \dfrac{2}{t}$

$f(t) = 4t^{-4} - 3t^{-3} + 2t^{-1}$

$f'(t) = -16t^{-5} + 9t^{-4} - 2t^{-2}$

32. $f(t) = 2t^2 + \sqrt{t^3}$

$f(t) = 2t^2 + t^{3/2}$

$f'(t) = 4t + \frac{3}{2}t^{1/2}$

36. $f(x) = 4x^{5/4} + 2x^{3/2} + x$

$f'(x) = 5x^{1/4} + 3x^{1/2} + 1$

(a) $f'(0) = 1$

(b) $f'(16) = 5(16)^{1/4} + 3(16)^{1/2} + 1$

$= 5 \cdot 2 + 3 \cdot 4 + 1$

$= 23$

39. $\lim_{h\to 0} \dfrac{3(2+h)^2 - (2+h) - 10}{h}$

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

comparing we get

$x = 2$

$f(x) = 3x^2 - x$ OR $f(x) = 3x^2 - x - 10$

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

$f'(2) = 6(2) - 1 = 11$

43. Find the tangent line at the point

$f(x) = x^4 - 3x^3 + 2x^2 - x + 1$, $(1,0)$

$f'(x) = 4x^3 - 9x^2 + 4x - 1$

$f'(1) = 4 - 9 + 4 - 1 = -2$

$m = -2$ & $y = mx + b$

$0 = -2(1) + b$, $b = 2$

$y = -2x + 2$

46. $f(x) = x^3 - 4x^2$

find where the tangent line is horizontal

$f'(x) = 3x^2 - 8x = 0$

$x(3x - 8) = 0$

$x = 0, 8/3$

69. avg speed: $f(t) = 20t - 40\sqrt{t} + 50$ ($\sqrt{t} = t^{1/2}$)

(a) $f'(t) = 20 - 20t^{-1/2}$

(b) 6am $\Rightarrow t = 0$

$f(0) = 50$

7am $\Rightarrow t = 1$

$f(1) = 30$

8am $\Rightarrow t = 2$

$f(2) = 90 - 40\sqrt{2} = 33.43145751$

(c) 6:30am $\Rightarrow$

$f'(1/2) = 20 - 20\sqrt{2} = -8.284271247$

7 am $\Rightarrow f'(1) = 0$

8am $\Rightarrow f'(2) = 20 - \dfrac{20}{\sqrt{2}} = 5.857864376$