3.4

35 $s = v_0 t - 16t^2$

$s' = v_0 - 32t = 0$

$v_0 = 32t$

$\frac{v_0}{32} = t$

$s = \left(\frac{v_0}{32}\right) v_0 - 16\left(\frac{v_0}{32}\right)^2 = 1900$

$= \frac{v_0^2}{32} - 16\frac{v_0^2}{32^2} = 1900$

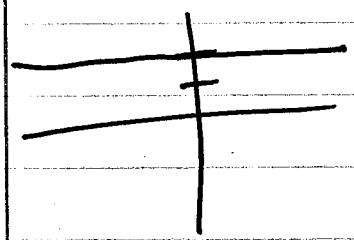
$\frac{v_0^2}{32} - 16\frac{v_0^2}{32 \cdot 32} = 1900$

$\frac{2}{2}\frac{v_0^2}{32} - \frac{v_0^2}{64} = 1900$

$\frac{2v_0^2 - v_0^2}{64} = 1900$

$\frac{v_0^2}{64} = 1900$

$v_0 = \sqrt{1900 \cdot 64}$



348.712 ft/sec $\frac{3600 \text{ sec}}{1 \text{ hr}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}}$

~~198.132 mi/hr~~ 237.758 mi/hr

37 $x(t) = 2t^3 - 13t^2 + 22t - 5$

$x'(t) = 6t^2 - 26t + 22$

$x''(t) = 12t - 26$

28 $r(x) = 2000\left(1 - \frac{1}{x+1}\right)$

$= 2000\left(\frac{x+1}{x+1} - \frac{1}{x+1}\right)$

$= 2000\left(1 - \frac{1}{x+1}\right)$

3.4

28 $r(x) = 2000\left(1 - \frac{1}{x+1}\right)$

$= 2000 + \frac{-2000}{x+1}$ $\quad f$ / g

$\frac{f'g - g'f}{g^2}$

$r'(x) = \frac{-1(-2000)}{(x+1)^2} = \frac{2000}{(x+1)^2}$

$r'(5) = \frac{2000}{6^2} \approx \#55.56$

$\lim_{x \to \infty} \frac{2000}{(x+1)^2} = 0$

25 $y = 6\left(1 - \frac{t}{12}\right)^2$

$= 6\left(1 - \frac{t}{6} + \frac{t^2}{144}\right)$

$= 6 - t + \frac{1}{24}t^2$

$y' = -1 + \frac{1}{12}t$

3.4

13 $s = 24t - .8t^2$

$v = 24 - 1.6t$

$a = -1.6$

$24 - 1.6t = 0$

$24 = 1.6t$

$\frac{24}{1.6} = t = 15$ seconds

$s = 24(15) - .8(15)^2 =$ **180 meters**

$24t - .8t^2 = 90$

$t = 4.393$ seconds

25.607 seconds

$0 = 24t - .8t^2$

$0 = t(24 - .8t)$

$t = 0$ $\quad 24 - .8t = 0$

$24 = .8t$

30 sec $\quad \frac{24}{.8} = t$

34 $V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

$= 4\pi(2)^2 = 16\pi \text{ ft}^3/\text{ft}$

$\frac{4}{3}\pi(2.2)^3 - \frac{4}{3}\pi(2)^3 \approx 11.0924$

$V = \frac{4}{3}\pi$

$\frac{dV}{dr} = 4\pi r^2$

$= 4\pi(2.2)^2 =$

$10.555 \text{ ft}^3/\text{ft}$

2 $A = \pi r^2 \quad C = 2\pi r$

$A = \pi\left(\frac{C}{2\pi}\right)^2 \quad \frac{C}{2\pi} = r$

$= \pi \frac{C^2}{4\pi^2}$

$= \frac{C^2}{4\pi}$

$A = \frac{C^2}{4\pi}$

$\frac{dA}{dC} = A' = \frac{2C}{4\pi} = \frac{C}{2\pi}$

$A'(\pi) = \frac{\pi}{2\pi} = \frac{1}{2}$

$A'(6\pi) = \frac{6\pi}{2\pi} = 3 \text{ in}^2/\text{in}$

3.4

8 $Q(t) = 200(30-t)^2 = 200(900 - 60t + t^2)$

$= 180{,}000 - 12{,}000t + 200t^2$

$Q'(t) = -12{,}000 + 400t$

$Q'(10) = -12{,}000 + 400(10) = -8{,}000$ gal/min

8,000 gal/min

$\frac{f(b)-f(a)}{b-a}$ (0,), (10,)

(0, 180,000), (10, 80,000)

$\frac{80{,}000 - 180{,}000}{10-0} = \frac{-100{,}000}{10} = -10{,}000$ gal/min

19 $s(t) = t^2 - 3t + 2$

$s(5) - s(0)$ (b) $\frac{10 \text{ meters}}{5 \text{ sec}} = 2$ m/sec

(a) $12 - 2 = 10$ meters

(c) $v(t) = s'(t) = 2t - 3$ (e) $2t - 3 = 0$

$s'(4) = 2(4) - 3 = 5$ m/sec $2t = 3$

$t = \frac{3}{2}$ sec

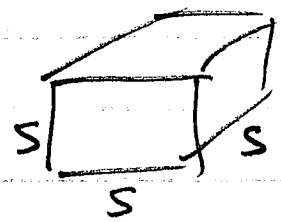
d $a(t) = v'(t) = s''(t) = 2$

$s''(4) = 2$ m/sec^2

(f) $s(\frac{3}{2}) = (\frac{3}{2})^2 - 3(\frac{3}{2}) + 2 =$

$-\frac{1}{4}$ meters

3.4



1 (a) $V = s^3$

(b) $\frac{dV}{ds} = 3s^2$

(c) $\frac{dV}{ds}(1) = 3(1)^2 = 3$

$\frac{dV}{ds}(5) = 3(5)^2 = 75$

(d) in^3/in

16

MOON

$s = 832t - 2.6t^2 = 0$

$t(832 - 2.6t) = 0$

$832 = 2.6t$

$320 sec = t$

EARTH

$s = 832t - 16t^2 = 0$

$t(832 - 16t) = 0$

$832 = 16t$

$52 sec = t$