p256

① $y = x\sqrt{2-x}$, $-2 \le x \le 2$

$y' = x \cdot \frac{1}{2\sqrt{2-x}} \cdot -1 + \sqrt{2-x} \cdot 1$

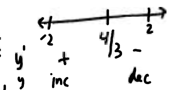
$= \frac{-x}{2\sqrt{2-x}} + \sqrt{2-x} \cdot \frac{2\sqrt{2-x}}{2\sqrt{2-x}}$

$= \frac{-x + 2(2-x)}{2\sqrt{2-x}}$

$y' = \frac{4-3x}{2\sqrt{2-x}}$

$y' = 0$ at $x = 4/3$

y' undef at $x = 2$



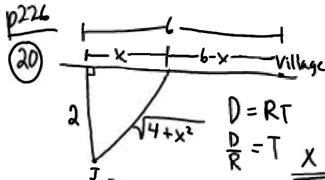
$x = 4/3$, $y = 1.09$ abs. max

$x = 2$, $y = 0$

$x = -2$, $y = -4$ abs. min

p226

⑳



$D = RT$

$\frac{D}{R} = T$

$T = \frac{\sqrt{4+x^2}}{2} + \frac{6-x}{5}$

$T' = \frac{1}{2 \cdot 2\sqrt{4+x^2}} \cdot 2x + \frac{1}{5} \cdot -1$

$T' = \frac{x}{2\sqrt{4+x^2}} - \frac{1}{5} = 0$

$\frac{x}{2\sqrt{4+x^2}} = \frac{1}{5}$

$5x = 2\sqrt{4+x^2}$

$25x^2 = 4(4+x^2)$

$25x^2 = 16 + 4x^2$

$21x^2 = 16$

$x = \pm\sqrt{\frac{16}{21}}$

Check: $x = \sqrt{\frac{16}{21}}$, $y = 2.12$

$x = 0$ $y = 2.2$

$x = 6$ $y = 3.16$

p226

#35 $f(x) = x^3 + ax^2 + bx$

a) local max at $x = -1$ and local min at $x = 3$

$f'(x) = 3x^2 + 2ax + b$

$f'(-1) = 0$

$f'(3) = 0$

$f'(-1) = 3(-1)^2 + 2a(-1) + b$

$= 3 - 2a + b = 0$

$f'(3) = 3(3)^2 + 2a(3) + b$

$= 27 + 6a + b = 0$

$-3 + 2a - b = 0$

$27 + 6a + b = 0$

$24 + 8a = 0$

$a = -3$

$b = -9$

b) min at $x = 4$

pt of infl at $x = 1$

$f'(x) = 3x^2 + 2ax + b$

$f''(x) = 6x + 2a$

$f'(4) = 0$

$f''(1) = 0$

$f'(4) = 3(4)^2 + 2a(4) + b$

$= 48 + 8a + b = 0$

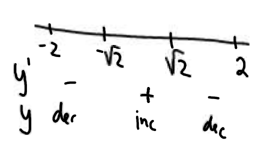
$f''(1) = 6 + 2a = 0$

$a = -3$, $b = -24$

p256

④ $y' = \frac{4-2x^2}{\sqrt{4-x^2}}$

$y' = 0$ at $x = \pm\sqrt{2}$



$x = -\sqrt{2}$ is local min

$x = \sqrt{2}$ is a local max

$x = -2$ is a local max

$x = 2$ is a local min

p226

(6) 4 by 8, $A = 32$

(12a) $x = 15$ ft, $y = 5$ ft

(14) a) 96 ft

b) 256 ft at $t = 3$

c) -128 ft/sec

(16) $r = 6.83$, $h = 6.83$

(18) $V(x) = 2x^3 - 25x^2 + 75x$

max 66.02 at $x \approx 1.96$

(20) 0.87 miles

16 $1000 = \pi r^2 h$ $\qquad h = \dfrac{1000}{\pi r^2}$

$SA = \pi r^2 + 2\pi r h$

When $SA' = 0$

$r = 6.83$

$SA = \pi r^2 + 2\pi r\left(\dfrac{1000}{\pi r^2}\right)$

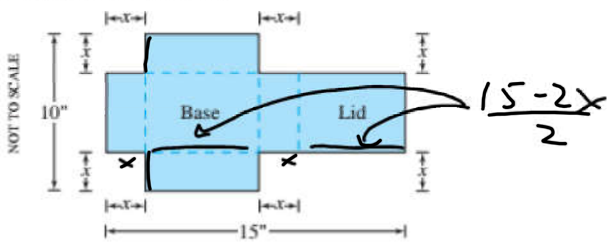
$\dfrac{1000}{\pi(6.83^2)} = h$

$SA = \pi r^2 + \dfrac{2000}{r}$

$SA' = 2\pi r - \dfrac{2000}{r^2}$

$6.83 = h$

18. *Designing a Box with Lid* A piece of cardboard measures 10- by 15-in. Two equal squares are removed from the corners of a 10-in. side as shown in the figure. Two equal rectangles are removed from the other corners so that the tabs can be folded to form a rectangular box with lid.



(a) Write a formula $V(x)$ for the volume of the box.

(b) Find the domain of V for the problem situation and graph V over this domain.

(c) Use a graphical method to find the maximum volume and the value of x that gives it.

(d) Confirm your result in part (c) analytically.

$V(x) = \left(\frac{15-2x}{2}\right)(10-2x)\,x$

$= 2x^3 - 25x^2 + 75x$

$D: 0 < x < 5$

c) $x \approx 1.96$

$V' = 6x^2 - 50x + 75$