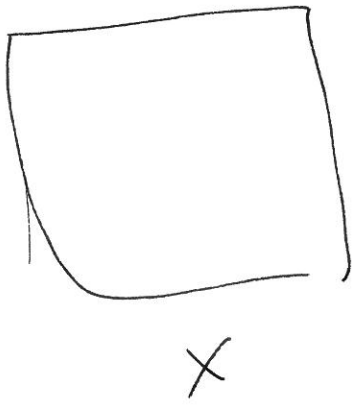


$A = XY$ ← one variable

$50 = 2X + 2Y$

$Y = 25 - X$

$25 = X + Y$ ~~$X = 25 - Y$~~

~~A~~ $= X(25 - X)$

$A(x) = 25x - x^2$

$A(x) = -x^2 + 25x$

EX 1

p313

$A'(x) = -2x + 25$

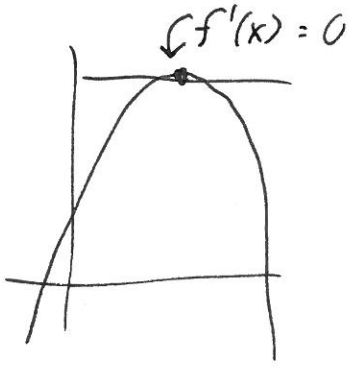
$0 = -2x + 25$

$2x = 25$

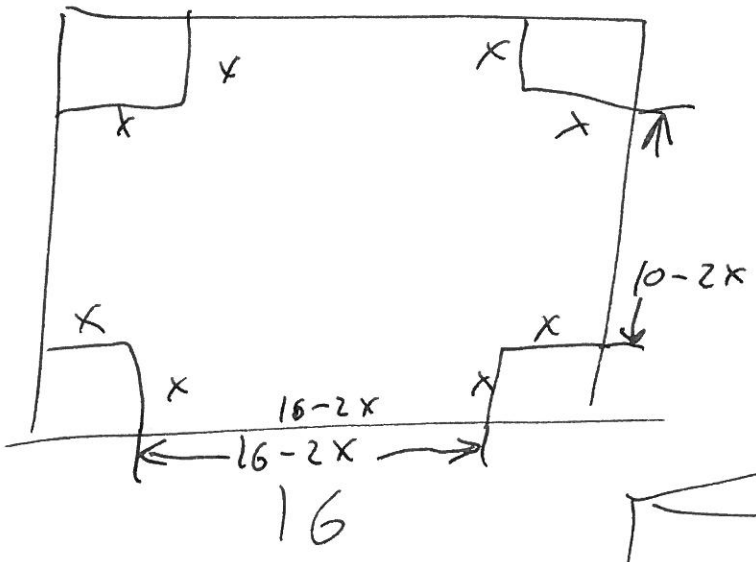
$x = 12.5$

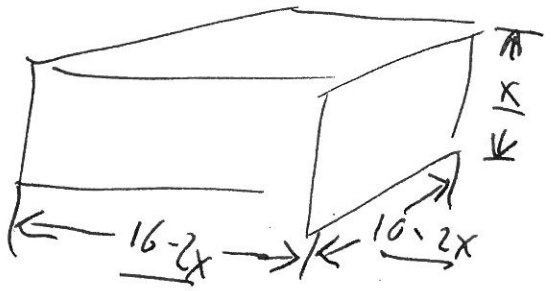
$25 = 12.5 + Y$

$Y = 12.5$



Ex 2
p 214



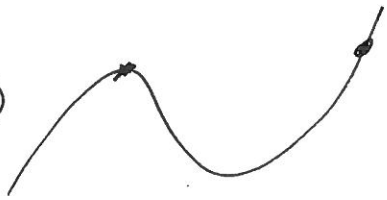


$V(x) = (16-2x)(10-2x)(x)$

$= 4(x^3 - 13x^2 + 40x)$ $\quad 0 < x < 5$

$\frac{d}{dx}[cf(x)] = cf'(x)$

$V'(x) = 4(3x^2 - 26x + 40)$



$0 = 4(3x^2 - 26x + 40)$ ↓ divide by 4

$0 = 3x^2 - 26x + 40$

$0 = (3x - 20)(x - 2)$

$0 = 3x - 20$ $\quad 0 = x - 2$

$20 = 3x$

~~$x = 20/3$~~

$x = 2$

$f(20/3)$

$f(0) = 0$

$f(5) = 0$

$f(2) = 144$

$x = 2$ $\quad V = 144$

EX 3
P315

$$R(x) = Px$$

$$m = \frac{3 - 3.50}{6000 - 5000} = \frac{-.5}{+1000} = -.0005$$

$$P - 3 = (-.0005)(x - 6000)$$

$$P = (-.0005x + 3) + 3$$

$$P = (-.0005x + 6)$$

$$R(x) = (-.0005x + 6)x$$

$$R(x) = -.0005x^2 + 6x$$

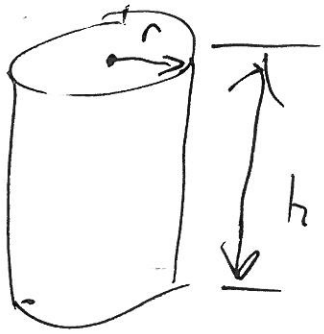
$$R'(x) = -.001x + 6$$

$$0 = -.001x + 6$$

$$-6 = -.001x$$

$$\boxed{x = 6000}$$

$V = 54 \longrightarrow V = \pi r^2 h$ volume of cylinder

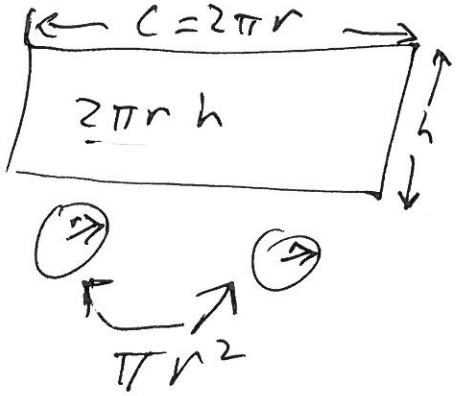


$S = \pi r^2 + 2\pi r h$

surface area of cylinder

$54 = \pi r^2 h$

$h = \frac{54}{\pi r^2}$ — plug this in



$S = \pi r^2 + 2\pi r\left(\frac{54}{\pi r^2}\right)$

simplify

$S = 2\pi r +$ ~~$2\pi r +$~~

$S = \pi r^2 + \frac{108}{r}$ $\quad 0 \le r$ $\quad 0 \le h \le$

$S' = 2\pi r + -1\,\frac{108}{r^2}$ $\longrightarrow \pi r^2 + 108x^{-1}$

$0 = \left(2\pi r - \frac{108}{r^2}\right) r^2$

$0 = 2\pi r^3 - 108$

$108 = 2\pi r^3$

$\sqrt[3]{\frac{108}{2\pi}} = r \approx 2.58$

$h = \frac{54}{\pi r^2} \approx \frac{54}{\pi (2.58)^2} \approx 2.58$

cost of ordering: $10,000

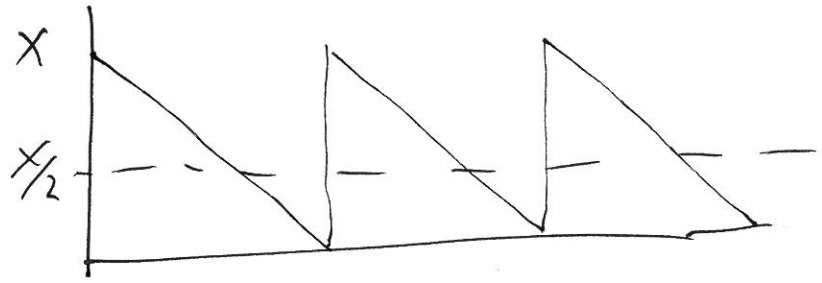
cost of storing: $200

demand per year: 10,000

X = ~~#of~~ quantity in shipment

$\frac{10000}{X}$ → number of shipments

$10000\left(\frac{10000}{X}\right)$ total cost of ~~orders~~ shipments



$X/2$ #motorcycles is storage on average

$200(X/2)$ cost of storage

$$C(X) = 10000\left(\frac{10000}{X}\right) + \frac{200X}{2} = \frac{10000^2}{X} + \frac{100}{}X$$

$$C'(X) = -\frac{10000^2}{X^2} + 100$$ ← if we set this equal to zero and solve, we should be able to find relative extrema

$$D = \frac{-10000^2}{x^2} + 100$$

$$0 = -10000^2 + 100x^2$$

$$10000^2 = 100x^2$$

$$\sqrt{10000^2} = \sqrt{100x^2}$$

$$10000 = 10x$$

$$x = 1000$$ ← this is the number of motorcycles per shipment that should minimize cost

$$\frac{10000}{x} = \frac{10,000}{1000} = 10$$

→ motorcycles per shipment