hw solutions
section 3.4

6. $C(x) = 5000 + 2x$

(a) avg cost funct: $\bar{C}$

$$\bar{C}(x) = \frac{C(x)}{x} = \frac{5000+2x}{x}$$

$$\bar{C}(x) = \frac{5000}{x} + 2$$

(b) marginal avg cost: $\bar{C}'$

$$\bar{C}'(x) = \frac{d}{dx}\left[\frac{5000}{x} + 2\right]$$

$$\bar{C}'(x) = -\frac{5000}{x^2}$$

(c) Interpret

since $\bar{C}'(x) < 0$ for all x's the rate of change for the cost funct is neg (definition). That means $\bar{C}(x)$ decreases as x increases. But if we look at $\lim_{x\to\infty} \bar{C}(x) = \lim_{x\to\infty}\left(\frac{5000}{x}+2\right) = 2$

ie: if we produce enough thermostates the unit costs drop to essentially \$2

33. $p = \sqrt{9 - 0.02x}$

compute $E(p)$ & find when elastic, inelastic, & unitary.

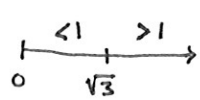
$$E(p) = -\frac{pf'(p)}{f(p)}, \text{ where } x = f(p)$$

$$p = \sqrt{9 - .02x} \Rightarrow x = 50(9 - p^2)$$

$$E(p) = \frac{-p\left[450 - 50p^2\right]'}{450 - 50p^2} = \frac{100p^2}{450 - 50p^2}$$

$$E(p) = \frac{2p^2}{9 - p^2}$$

$$E(p) = 1 \Rightarrow 2p^2 = 9 - p^2$$
$$3p^2 = 9$$
$$p = \sqrt{3}$$




unitary: $E(p) = 1 \Rightarrow p = \sqrt{3}$

elastic: $E(p) > 1 \Rightarrow \sqrt{3} < p$

inelastic: $E(p) < 1 \Rightarrow 0 \le p < \sqrt{3}$

13. $p = 600 - 0.05x, \quad 0 \le x \le 12{,}000$

$C(x) = 0.000002x^3 - 0.03x^2 + 400x + 80{,}000$

(a) Revenue funct:

$$R(x) = px = (600 - 0.05x)x = 600x - 0.05x^2$$

profit funct:

$$P(x) = R(x) - C(x) = \left[600x - 0.05x^2\right] - \left[0.000002x^3 - 0.03x^2 + 400x + 80{,}000\right]$$
$$= -.000002x^3 - .02x^2 + 200x - 80{,}000$$

(b) marginal cost:

$$C'(x) = 0.000006x^2 - 0.06x + 400$$

marginal revenue:

$$R'(x) = 600 - 0.1x$$

marginal profit:

$$P'(x) = -.000006x^2 - .04x + 200$$

(c) $C'(2000)$ = the additional cost to make the $2001^{st}$ TV = \$304

$R'(2000)$ = actual revenue from sale of the $2001^{st}$ TV = \$400

$P'(2000)$ = approximation of the actual profit/loss from the sale of the $2001^{st}$ TV = \$96 profit

(d) graph C, R, P & interpret