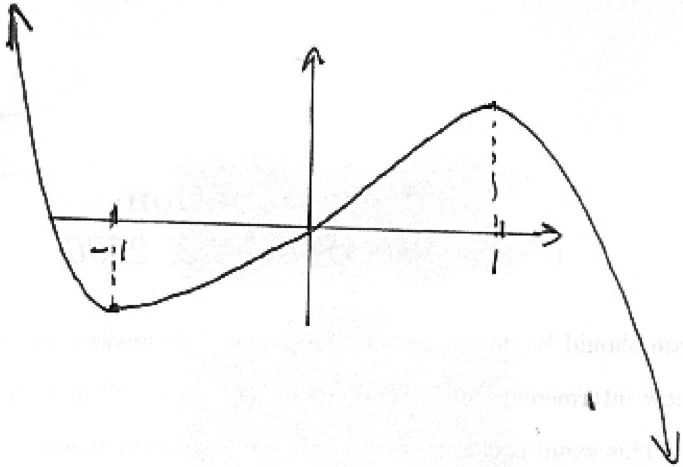
Math. 250-08, Fourth Examination Answers, Wednesday, April 12, 2006

(1) There are many possible answers. One of them is:



(2) (a) $f'(x) = 2x - 1 = 0$ when $x = 1/2$. $f''(x) \equiv 2 > 0$, so $x = 1/2$ corresponds to a local minimum.

(b) The global minimum and maximum occurs either at the critical point from part (a) or at the end points of the interval. The candidates are thus:

x	$f(x)$	
0	0	
2	2	← global max
1/2	-1/4	← global min.

The global maximum on $[0,2]$ is thus 2, and it occurs at $x=2$.

The global minimum is $-1/4$, and it occurs at $x = 1/2$.

(3) (a) The fixed cost is 0.

(b) $P(q) = 7q - (.01q^3 - 0.6q^2 + 13q)$

$= -0.01q^3 + 0.6q^2 - 6q.$

$P'(q) = -0.03q^2 + 1.2q - 6 = 0$ when

$$q = \frac{-1.2 \pm \sqrt{(1.2)^2 - (.12)6}}{2(-0.03)} = \frac{-1.2}{-.06} \pm \frac{\sqrt{1.44 - .72}}{-.06}$$

$$= 20 \pm \frac{1.2}{\sqrt{2}(.06)} \approx 20 \pm 14.14 \approx 34 \text{ or } 6.$$

$P''(q) = -.06q + 1.2 \quad P''(6) = +.84 > 0;\ P''(34) = -.84 < 0,$

so the maximum ~~at~~ should occur at around 34.

$\boxed{P(34) = 96.56}$.

4(a) The marginal cost is:

$C'(q) = 0.03q^2 - 1.2q + 13.$

The minimum marginal cost occurs where

$C''(q) = 0.06q - 1.2 = 0$, namely $q = \cancel{0.30}\ 1.2/0.06 = \boxed{20}$

$C'(20) = (.03)(400) - 1.2(20) + 13 = \boxed{1}$

(b) $a(q) = C(q)/q = \dfrac{.01q^3 - 0.6q^2 + 13q}{q} = .01q^2 - 0.6q + 13.$

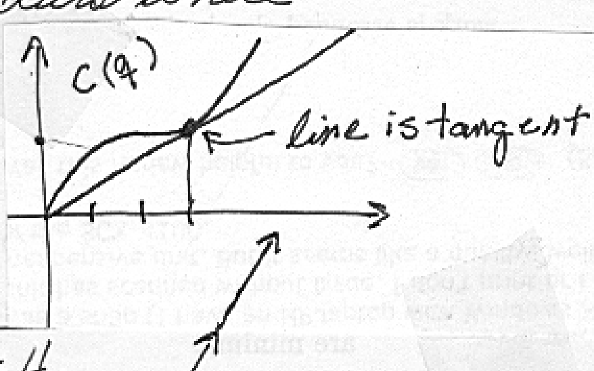
(c) The minimum average cost occurs where

$a'(q) = 0.02q - 0.6 = 0 \Rightarrow$

$q = 0.6/0.02 = 30.$

The lowest average cost is

$a(30) = .01(30^2) - .6(30) + 13 = 4.$



(d) $C'(30) = 0.03(30^2) - 1.2(30) + 13 = 4.$

$a(30) = C'(30)$. These two quantities must be equal where the average cost is minimum