8-7 Extreme Problems in Economics

1. $C(x) = 280{,}000 + 12.5x + 0.07x^2$

a) average cost $= \dfrac{280{,}000 + 12.5(1000) + 0.07(1000)^2}{1000}$

$= \dfrac{280{,}000 + 12500 + 70{,}000}{1000}$

$= \dfrac{362500}{1000}$

$= \$362.50$ / item

marginal cost: $C'(x) = 12.5 + 0.14x$

$C'(1000) = 12.5 + 0.14(1000)$

$= 12.5 + 140$

$= \$152.50$ / item

b) $c(x) = \dfrac{280{,}000 + 12.5x + 0.07x^2}{1x}$

$= 280{,}000x^{-1} + 12.5 + 0.07x$

$C'(x) = -280{,}000x^{-2} + 0.07$

$= -\dfrac{280{,}000}{x^2} + 0.07$

$\therefore \quad -\dfrac{280{,}000}{x^2} + 0.07 = 0$

$-\dfrac{280{,}000}{x^2} = -0.07$

$-280{,}000 = -0.07x^2$

$4{,}000{,}000 = x^2$

$2000 = x$

average cost is least at 2000 items

c) $\dfrac{280{,}000}{2000} + 12.5 + 0.07(2000) =$

$140 + 12.5 + 140 =$

$\$292.50$ / item

min. av. cost

8-7 cont.

2. $C(x) = 6400 + \frac{x}{10} + \frac{x^2}{1000}$

a) $\frac{6400 + \frac{3000}{10} + \frac{3000^2}{1000}}{3000} =$

$\frac{6400 + 300 + 9000}{3000} =$

$\frac{15700}{3000} =$

$\$5.23$/unit av. cost.

$C(x) = 6400 + 0.1x + 0.001x^2$

$C'(x) = 0.1 + 0.002x$

$C'(3000) = 0.1 + 0.002(3000)$

$= 0.1 + 6$

$= \$6.10$/unit marg. cost

b) $c(x) = \frac{6400 + 0.1x + 0.001x^2}{x}$

$= 6400x^{-1} + 0.1 + 0.001x$

$c'(x) = -6400x^{-2} + 0.001$

$\therefore \quad -\frac{6400}{x^2} + 0.001 = 0$

$-\frac{6400}{x^2} = -0.001$

$\frac{-6400}{-0.001} = x^2$

$6{,}400{,}000 = x^2$

$2529.82 \simeq x$

$2530 \simeq x$

units

c) $\frac{6400}{2530} + 0.1 + 0.001(2530) =$

$2.5296 + 0.1 + 2.53 =$

5.1596

$\$5.16$/unit

min. av. cost