

Take home 2 - Key

$$C(x) = -(x^2 - 40x + 1200)$$

$$= -(x + 20)(x - 60)$$

roots: $x = -20, 60$

a) $C'(x) = 40 - 2x$

b) $C'(15) = 40 - 30 = \$10$, $C'(25) = 40 - 50 = -\$10$

c) It costs \$10 more to produce 16th unit than the 15th.
It costs \$10 less to produce 26th unit than the 25th.

d) $P(x) = R(x) - C(x)$ where $R(x) = px = 50x$, $C(x)$ given

$$P(x) = 50x - (1200 + 40x - x^2) = -1200 + 10x + x^2 = x^2 + 10x - 1200$$

Set profit $P(x) = (x - 30)(x + 40) = 0$

e) $x = 30$ units; sell this amount to breakeven
(reject $x = -40$ solution to quadratic)

f) $C(30) = 1200 + 40(30) - 30^2 = 2400 - 900 = \1500

$R(30) = 50(30) = \$1500$ ✓

g) $P(21) - P(20) = (21^2 + 10(21) - 1200) - (20^2 + 10(20) - 1200)$

$$= 21^2 - 20^2 + 10(21) - 10(20)$$

$$= (21 + 20)(21 - 20) + 10(21 - 20)$$

$$= (41)(1) + 10(1) = \$51$$

Compare to marginal profit at $x = 20$:

Find $P'(x)$ first: $P(x) = x^2 + 10x - 1200$

$P'(x) = 2x + 10$, $P'(20) = \$50$

h) $\$51 > \50 but not significant; P' good indicator of profit trend

