Name: Solutions

Directions: Show all work. No credit for answers without work.

1. [**5 points**] When the price of a movie ticket is \$7, a local theater sells 200 tickets. For every \$0.50 increase in price, the theater sells 9 fewer seats. Find the price that maximizes revenue.

Demand Eqn: Demand q is a linear function of price p.

- $m = \frac{-9}{0.5} = -18$
- $(p_0, q_0) = (7, 200)$

$q - q_0 = m(p - p_0)$

$q - 200 = -18(p - 7)$

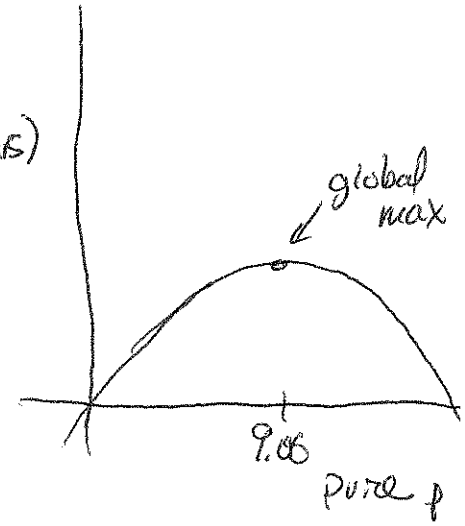
$q = -18p + 326$

Revenue = Price · Demand

$R(p) = p \cdot q = p(-18p + 326)$

$= -18p^2 + 326p$

$R'(p) = -36p + 326$

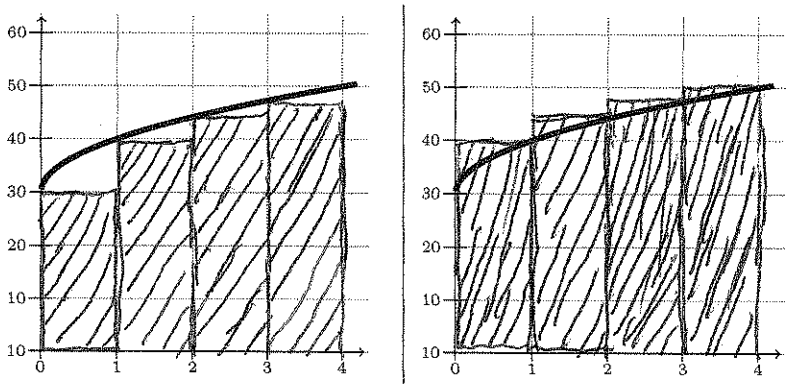


Crit pts: $-36p + 326 = 0$

$p = \frac{-326}{-36} \approx 9.06$

So a price of \$9.06 maximizes revenue.

2. [**5 points**] At time t, a car travels at a speed of $30 + 10\sqrt{t}$ miles per hour. In this problem, we estimate the total distance the car travels between time $t = 0$ hours and time $t = 4$ hours.



(a) Underestimate (b) Overestimate

(a) Using 4 rectangles, give an underestimate for the total distance traveled. Illustrate your underestimate above in Figure (a).

Area $\approx 1 \cdot 30 + 1 \cdot 40 + 1 \cdot 44.1 + 1 \cdot 47.3$

$\approx$ **161.4 miles**

(b) Using 4 rectangles, give an overestimate for the total distance traveled. Illustrate your overestimate above in Figure (b).

Area $\approx 1 \cdot 40 + 1 \cdot 44.1 + 1 \cdot 47.3 + 1 \cdot 50$

$=$ **181.4 miles**

(c) Average the two estimates together to obtain an approximation to the total distance traveled. Is this average an overestimate or an underestimate for the true distance traveled?

Avg: $\frac{1}{2}(161.4 + 181.4) =$ **171.4 miles**

an underestimate

Not part of this problem, but:

True distance ≈ 173.33