

MATH 111 – EXAM I Hints and Answers
Version Beta
Autumn 2009

1. (a) (4 points) HINT: Draw the secant line through car A 's distance graph at $t = 15$ and $t = 20$ and compute the slope.
ANSWER: ~ 0.842 mpm
 - (b) (3 points) HINT: The cars have the same average trip speed only when their distance graphs intersect.
ANSWER: $t \approx 47.5$ minutes
 - (c) (4 points) HINT: Draw a diagonal line with slope 0.75 and find the times at which it intersects the graph of car B 's distance.
ANSWER: $t \approx 12, 48$ minutes
 - (d) (3 points) HINT: Look for a time at which car A 's distance graph is 15 units higher than car B 's distance graph.
ANSWER: $t \approx 38$ minutes
 - (e) (8 points)
 - i. ANSWER: $\frac{A(57.5)-A(55)}{2.5} > \frac{B(57.5)-B(55)}{2.5}$; This is False.
 - ii. ANSWER: $A(57.5) - A(55) > B(57.5) - B(55)$; This is False.
2. (3 points each)
 - (a) ANSWER: The graph of $O(t)$ is a diagonal line with slope 3.
 - (b) HINT: You need to find the amount of the largest shortage: the biggest vertical gap between $O(t)$ and $I(t)$ on the portion of the graph where $O(t)$ is above $I(t)$.
ANSWER: ~ 12.5 thousand gallons
 - (c) NOTE: This was a typo: the problem should have read "Name a one-**hour** interval..."
HINT: Using the graph of $O(t)$ as your reference line, find a one-hour interval during which the secant line through the graph of $I(t)$ is parallel to the graph of $O(t)$.
ANSWER: from $t \approx 8.5$ to $t = 9.5$ OR $t \approx 13$ to $t = 14$
 - (d) HINT: Find the slope of the steepest diagonal line that intersects the graph of $I(t)$.
ANSWER: ~ 3.64 thousand gallons per hour
 - (e) HINT: At $t = 15$, 51 thousand gallons have flowed into the reservoir, while 45 thousand have flowed out. So, the amount in the reservoir at $t = 15$ is $20 + 51 - 45$.
ANSWER: ~ 26 thousand gallons
 3. (a) HINT: The change in TR if quantity changes from 170 to 171 Things is simply the marginal revenue at 170.
ANSWER: ~ 16.20 dollars
 - (b) HINT: Profit is maximized at the first whole number quantity at which MR becomes less than or equal to MC .
ANSWER: $q \approx 242$ Things
 - (c) HINT: Breakeven price is the " y "-coordinate of the point of intersection of MC and AC .
ANSWER: 9 dollars per Thing
 - (d) HINT: $AC(50) = 16.60$, $TC(50) = 16.60 \cdot 50 = 830$, $VC(50) = TC(50) - FC = 830 - 150 = 680$, and $AVC(50) = \frac{VC(50)}{50} = 13.60$
ANSWER: ~ 13.60 dollars per Thing