MATH 111

Exam I – Version 2!

Hints and Answers

1. (a) (4 points) HINT: Find the formula for total cost ($TC = AC \times q$) and compute $TC(0)$.
   ANSWER: $FC = \$55$

   (b) (4 points) HINT: $TR(q) = 3.20q$ and $TC(q) = 0.01q^2 + 0.8q + 55$. Compute profit at 200: $TR(200) - TC(200)$.
   ANSWER: \$25

   (c) (4 points) ANSWER: $MC(q) = 0.02q + 0.81$

   (d) (5 points) HINT: Breakeven price is the "y"-coordinate of the point at which marginal cost and average cost intersect. Set $MC = AC$ and solve for q ($q = 73.66$). To get the "y"-coordinate of the point of intersection, plug this value of q into either the MC function or the AC function.
   ANSWER: \$2.28

2. (4 points each)

   (a) HINT: Find the x-coordinate of the vertex of each parabola. $g(x)$ increases for x's up to $x = 75$. $f(x)$ increases for all x's after $x = 20$.
   ANSWER: from $x = 20$ to $x = 75$

   (b) HINT: Set $f(x) = g(x)$ and solve for x.
   ANSWER: from $x = 12.01$ to $x = 101.33$

   (c) HINT: Find the formula for the distance between the graphs: $D(x) = g(x) - f(x)$. This will be a quadratic function whose graph is a parabola that opens down. Use the vertex formula to find the value of x for which $D(x)$ is largest.
   ANSWER: $x = 56.67$

   (d) HINT: $h(30) = f(30) = 41$ and $h(50) = g(50) = 107.5$. So, $h(x)$ is the line that goes through the points $(30, 41)$ and $(50, 107.5)$.
   ANSWER: $h(x) = 3.325x - 58.75$

3. (a) (4 points) HINT: Bicyclist B's average trip speed is: $\frac{D_B(t)}{t} = \frac{35t - 0.075t^2}{t} = 35 - 0.075t$. Set this equal to 22.25 and solve for t.
   ANSWER: $t = 170$ seconds

   (b) (4 points) HINT: Since speed is linear, average speed over the interval from $t = 2$ to $t = 5$ seconds is the speed half-way between $S_A(2)$ and $S_A(5)$. $S_A(2) = 39.56$ and $S_A(5) = 38.9$.
   ANSWER: average speed $= \frac{39.56+38.9}{2} = 39.23$ feet per second.

   (c) (4 points) HINT: Use the formula developed in Worksheet 17 to get a quadratic distance formula from a linear speed formula.
   ANSWER: $D_A(t) = 40t - 0.11t^2$

   (d) (5 points) HINT: Set $D_A(t) = 3500$ and solve for t There are two solutions: $t = 146.61$ and $t = 217.03$. So, bicyclist A gets to the finish line after 146.61 seconds (and would then stop – so the 217.03 is irrelevant. Set $D_B(t) = 3500$ and solve for t. Again, there are two solutions: $t = 145.14$ and $t = 321.53$. So, bicyclist B gets to the finish line after 145.14 seconds.
   ANSWER: Bicyclist B wins.