

**Math 111**

Winter 2003

Exam I - Hints and Answers

Some questions require you to approximate values from a graph. In these cases, we accept answers from a range of values.

1. (a) ACCEPTABLE ANSWERS: from \$2.60 to \$2.85  
(b) ACCEPTABLE ANSWERS: from \$2.15 to \$2.35  
(c) HINT: Draw a tangent line at  $q = 250$  and compute its slope.  
ACCEPTABLE ANSWERS: from \$1.75 to \$2.25  
(d) HINT:  $AC = MC$  when  $AC$  is at its lowest value.  $AC$  is the slope of a diagonal line through the  $TC$  graph; due to the small scale of the graph, we can use the slope of a tangent line to the  $TC$  graph to approximate the  $MC$ . So, you need to find the quantity at which a diagonal line is also a tangent line. (You drew this line in part (a).)  
ACCEPTABLE ANSWERS: from 690 to 710 peelers
2. (a) ACCEPTABLE ANSWERS: from \$450 to \$500  
(b) HINT: You need to find the quantities at which the tangent line to  $TC$  is parallel to a line with slope 1.2. Draw a reference line with slope 1.2.  
ACCEPTABLE ANSWERS: We'd accept each of these answers plus or minus 25: 500, 850, 1400, and 1750 shoehorns. (You must give all four for full credit.)  
(c) HINT: You need to draw the graph of  $TR$  (a diagonal line with slope 2.7) and find where  $TR$  and  $TC$  intersect.  
ACCEPTABLE ANSWERS: from 750 to 800 shoehorns
3. (a) ACCEPTABLE ANSWERS: from 1.29 to 1.31 feet per year  
(b) ACCEPTABLE ANSWERS: from 1.15 to 1.20 feet per year  
(c) ANSWER: The tree grew slower from  $t = 7$  to  $t = 18$  years than it did from  $t = 13$  to  $t = 18$ .  
(d) ANSWER: The tree grew 13 feet from year 6 to year 16.
4. (a) HINT: The shutdown price is the smallest value of  $AVC$  and the height of the graph at the point where  $MC$  intersects  $AVC$ .  
ACCEPTABLE ANSWERS: from \$1.45 to \$1.50  
(b) ACCEPTABLE ANSWERS: from \$2.01 to \$2.20  
(c) HINT: Use the fact that  $AVC = \frac{VC}{q}$ .  $AVC$  for producing 100 thumbs looks to be about \$4.00.  
ACCEPTABLE ANSWERS: from \$390 to \$400  
(d) HINT: Compute  $TR$  if you 550 thumbs for \$4.10 each. To find  $TC$ , use the same method you used in part (c) to first find  $VC$  for 550 thumbs. Then add on your fixed costs. Profit is then  $TR - TC$ .  
ACCEPTABLE ANSWERS: from \$100 to \$155