

**MATH 111**  
Autumn 2004 – Final Exam  
Hints and Answers

1. (a) HINT: Use the formula  $A = P(1 + r)^k$ .  
ANSWER: \$3616.72
- (b) HINT: Use the simple interest formula  $A = P(1 + rt)$ .  
ANSWER: 5.72 years
- (c) HINT: Use the formula  $A = Pe^{rt}$ . Then, after 5.7 years,  $A = 3P$  and thus  $3P = Pe^{5.7r}$ .  
ANSWER: 19.27%
- (d) HINT: Use the formula  $A = P(1 + \frac{r}{n})^{nt}$ . Again, after 5.7 years,  $A = 3P$ .  
ANSWER: 19.43%
2. (a) ANSWER: Terry's APY: 4.0604%; Sherry's APY: 6.184%
- (b) HINT: Use  $A = P(1 + \frac{r}{n})^{nt}$  with  $A = 4500$ ,  $r = 0.04$ ,  $n = 4$ , and  $t = \frac{30}{12}$ .  
ANSWER: \$4073.79
- (c) HINT: Suppose that, at the beginning of eight months, the balance is  $P$  dollars. Then, eight months later, the balance is  $Pe^{0.06(\frac{8}{12})}$ . The change in the balance is  $Pe^{0.06(\frac{8}{12})} - P$ . The percentage change is the change divided by  $P$ , times 100%.  
ANSWER: 4.08%
- (d) HINT: After 5 years, Terry has  $D(1.01)^{20}$  in her account. If Sherry starts with  $P$  dollars, then the amount in her account after 5 years is  $Pe^{0.06(5)}$  dollars. Set these two amounts equal to each other and solve for  $P$ .  
ANSWER:  $0.90D$  dollars
3. (a) HINT: Draw the straight-line  $TR$  graph (a diagonal line with slope 20) and find the largest  $q$  where it intersects  $TC$ .  
ANSWER: something between 7.5 and 8 thousand Chumbos
- (b) HINT:  $TC(9) \approx 223$  and  $FC \approx 52$ . Use these to compute  $VC(9)$  and then  $AVC(9)$ .  
ANSWER: approximately 19 dollars per Chumbo
- (c) ANSWER: approximately \$14.29
- (d) HINT: Draw a diagonal line with slope 35 and see where it crosses the  $TC$  graph.  
ANSWER: approximately 1.8 thousand Chumbos
4. (a) Start by finding the equations of the linear speed functions using the info given in the graph:  $S_A(t) = -2.5t + 25$  and  $S_B(t) = -0.625t + 10$ .  
ANSWER:  $D_A(t) = -1.25t^2 + 25t$  and  $D_B(t) = -0.3125t^2 + 10t$
- (b) HINT: Either find where the speed graphs cross (by setting  $S_A(t) = S_B(t)$  and solving for  $t$ ) or find the  $t$ -coordinate of the vertex of the quadratic function  $D(t) = D_A(t) - D_B(t)$ .  
ANSWER:  $t = 8$  seconds
- (c) HINT: Set  $D_A(t) = D_B(t) + 42$  and solve for  $t$ .  
ANSWER: 3.62 seconds
- (d) HINT: Car  $A$ 's average trip speed is  $-1.25t + 25$ .  
ANSWER: 7.2 seconds
5. (a) HINT: The two points (100, 30) and (250, 330) are both on the graph of the linear profit function. You should be able to find the equation for profit:  $P = 2q - 170$ .  
ANSWER: 585 rigfins
- (b) HINT: Profit equals  $2q - 170$ , but Profit also equals  $TR - TC$ . We know market price is a constant  $p$ ; so  $TR = pq$ . We know  $MC$  is a constant 3; so,  $TC = 3q + FC$ . So, now profit equals  $TR - TC = pq - (3q + FC)$ . Set this equal to  $2q - 170$ .  
ANSWER:  $p = \$5$  and  $FC = \$170$

- (c) HINT:  $TC = 3q + 170$  and so  $AC = 3 + \frac{170}{q}$ .  
ANSWER:  $q = 107$  rigfins
6. (a) HINT:  $TR(3) = MR(0) + MR(1) + MR(2)$   
ANSWER: 331 dollars
- (b) HINT: You want the first whole number of Forrubs at which  $MR$  drops below  $MC$ .  
ANSWER: 9 Forrubs
- (c)  $TR$  goes up by \$127 and  $TC$  goes up by \$82.  
ANSWER: Profit increases by \$45.
- (d) HINT: Shutdown price is the smallest value of  $AVC$  and  $AVC(q) = 0.001q^2 - 1.59q + 845.7$ . This is a quadratic function whose graph is a parabola that opens upward. Find the “ $y$ ”-coordinate of its vertex.  
ANSWER: \$213.68