MATH 111 – FINAL EXAM Hints and Answers
Autumn 2007

1. (a) HINT: Draw the least steep diagonal line that intersects TC and compute its slope.
   ANSWER: approximately \$6.67 per Krumpette
   (b) HINT: Draw a diagonal line with slope 11 and find the quantity at which it intersects AC.
   ANSWER: approximately 5.8 Krumpettes
   (c) HINT: Draw the line tangent to TC (or VC) at $q = 15$ and compute its slope.
   ANSWER: approximately 12 dollars or dollars per Krumpette
   (d) HINT: Sketch the graph of TR, a diagonal line with slope 7.5, and find the quantities at which the TR graph is above the TC graph.
   ANSWER: from about 10.6 to about 16.3 hundred Krumpettes
   (e) HINT: Slide your ruler to find the quantities at which the tangent line to TC is parallel to TR.
   ANSWER: approximately 3.7 and 13.7 hundred Krumpettes
   (f) HINT: Find the largest vertical gap between TR and TC (when TR is above TC).
   ANSWER: approximately 12.5 hundred dollars (or 1250 dollars)

2. (a) TRANSLATION: The average trip speed of the red car at $t = 14$ seconds is 1.29 feet per second.
   (b) TRANSLATION: $R(5) - R(1) > R(6) - R(2)$
   (c) ANSWERS: F; F; T

3. (a) $TC(q) = cq + f$, $TR(q) = pq$
   (b) HINT: Set $TR(q) - TC(q) = 100$ and solve for q.
   ANSWER: $q = \dfrac{100 + f}{p - c}$ Pies
   (c) HINT: Use your answer to part (b).
   ANSWER: $q = 140$ Pies

4. (a) HINT: Evaluate $H(0)$.
   ANSWER: 15 feet
   (b) HINT: The height of the rock is a quadratic whose graph is a parabola that opens down. The greatest height the rock reaches is the "y"-coordinate of the vertex.
   ANSWER: 24.77 feet
   (c) HINT: The rock hits sea level when $H(t) = 0$.
   ANSWER: 2.03 seconds
   (d) HINT: The height of the second rock at time t is $H(t - 10)$.
   ANSWER: $-16t^2 + 345t - 1835$

5. (a) HINT: The balance changes from an OLD value, $A(3) = P(1.02)^3$, to a NEW value, $A(3.2) = P(1.02)^{3.2}$. Use the formula for proportionate change and simplify.
   ANSWER: 0.004
   (b) HINT: You have two options. Either use the fact that $A(5) = P(1.02)^5 = 2345$ to compute your principal now ($P = 2123.94$) and then use that value to compute $A(5.5)$. Or just compute what a principal of \$2345 would become after 0.5 years: $2345(1.02)^{0.5}$.
   ANSWER: \$2368.33

(c) HINT: Use the fact that $A(10) = P(1.02)^{10} = 1234$ to compute P. Then use the value of P that you find to compute $A(8.5)$ and $A(7)$ and subtract those two balences.
ANSWER: \$35.05

6. (a) HINT: Solve for r: $295000(1 + r)^7 = 367000$.
ANSWER: $r = 0.0317$

(b) HINT: Either let $B(k) = B(0) \cdot 2^k$, where k is the number of 10-minute periods that have elapsed, set $B(4.2) = 260$ and solve for $B(0)$; or let $B(t) = B(0) \cdot B^{t/10}$, where t is time in minutes, set $B(42) = 260$ and solve for $B(0)$.
ANSWER: 14.15 million bacteria

(c) HINT: $A(t) = 3000(1.25)^t$, where t is time in years. You want $A(4.75)$.
ANSWER: \$8658.52

7. (a) A: \$11,600; B: \$11,410.95; C: \$11,399.68; A is best

(b) A: \$18,000; B: \$19,346.77; C: \$19,251.43; B is best

(c) ANSWER: 6.77%

8. (a) HINT: Solve for t: $50000e^{0.098t} = 1500000$.
ANSWER: 34.71 years

(b) HINT: Solve for t: $50000\left(1 + \frac{0.098}{4}\right)^{4t} = 1500000$.
ANSWER: 35.13 years

(c) HINT: Solve for r: $50000\left(1 + \frac{r}{12}\right)^{12\cdot 40} = 2000000$.
ANSWER: 9.26%