

MATH 111 WINTER 2006
FINAL EXAM HINTS AND ANSWERS

1. (a) HINT: Let $B(k)$ be the number of bacteria present after k fifty-minute periods. Then $B(k) = 4^k \cdot 100$. You want $B(3)$.
ANSWER: 6400 bacteria
- (b) HINT: Solve the equation $734 = P \left(1 + \frac{0.03}{4}\right)^{4\left(\frac{10}{12}\right)}$ for P .
ANSWER: \$715.94
- (c) HINT: Solve $1800 = 1200e^{r(7)}$ for r .
ANSWER: 5.79%
- (d) HINT: Your balance after 5 months is $700(1.0133)^{5/12} = \$703.86$. Compute the percentage change $\left(\frac{\text{NEW} - \text{OLD}}{\text{OLD}} \times 100\%\right)$ using $\text{OLD} = \$700$ and $\text{NEW} = \$703.86$.
ANSWER: 0.55%
- (e) HINT: Solve $1 = Pe^{0.112(4)}$ for P .
ANSWER: \$0.64
- (f) HINT: Solve $3P = P \left(1 + \frac{0.0875}{12}\right)^{12t}$ for t . (The P 's cancel.)
ANSWER: 12.60 years
2. (a) i. ANSWER: $P(10) - P(3) > P(17) - P(10)$
ii. ANSWER: true
- (b) i. ANSWER: $\frac{P(8) - P(3)}{5} > \frac{P(31) - P(3)}{28}$
ii. ANSWER: true
- (c) HINT: Draw a line with slope 0.05 and with the same “ y ”-intercept as the graph of stock price. On what day does it intersect the stock price graph?
ANSWER: January 17
3. All answers are approximate.
 - (a) HINT: The SDP is the “ y ”-coordinate of the point of intersection of MC and AVC .
ANSWER: \$5.30
 - (b) HINT: The change in TC that occurs if production is increased from 600 to 601 Things is simply the marginal cost at 600 Things. Since we’re measuring quantity in hundreds of Things, we’re looking for $MC(6)$.
ANSWER: \$4.50
 - (c) HINT: Average variable cost at $q = 2$ is \$7.50. Also, $AVC(2) = \frac{VC(2)}{2}$. So, $VC(2) = AVC(2) \times 2$.
ANSWER: 15 hundred dollars.
 - (d) HINT: If Things sell for \$10 each, then the graph of MR is a horizontal line with height 10. See where this horizontal line intersects the graph of MC .
ANSWER: $q = 9.5$ hundred Things
4. (a) ANSWER: $MR(q) = -0.4q + 399.8$

- (b) HINT: The graph of TR is a parabola that opens downward. The maximum TR occurs at the vertex.
ANSWER: \$200,000
- (c) ANSWER: $VC(q) = -0.1q^2 + 200q$
- (d) HINT: $TC(q) = VC(q) + FC = -0.1q^2 + 200q + 20,000$. Set $TC = TR$ and solve for q .
ANSWER: $q = 105.57$ consoles
5. (a) HINT: Set $C(t) = 0$ and solve for t .
ANSWER: $t = 13$ days
- (b) $A(t) = S(t) + C(t) = -0.5t^2 + 7t + 38$. The graph of $A(t)$ is a parabola that opens downward. It is largest at its vertex.
ANSWER: $t = 7$ days
- (c) HINT: The average rate of change is $ds \frac{S(10) - S(2)}{8}$.
ANSWER: 1 thousand dollars per day
- (d) HINT: $N(t) = C(t - 10) = -(t - 10)^2 + 12(t - 10) + 13$. Expand and simplify.
ANSWER: $N(t) = -t^2 + 32t - 207$
6. (a) ANSWER: $25 \times \$2.9$ million = 72.5 million dollars
- (b) HINT: You spend 20.5 million and invest 20.5 million. After 24 years, the money you invested is worth 66.11 million dollars.
ANSWER: 66.11 million + 20.5 million = 86.61 million dollars
- (c) HINT: You spend Y million and invest $41 - Y$ million. After 24 years, the money you invested is worth $(41 - Y)(1.05)^{24}$. So, your total income from this option is $Y + (41 - Y)(1.05)^{24}$. Set this equal to 72.5 and solve for Y .
ANSWER: $Y = 26.84$ million dollars