Exam I Sample Questions (from OLD exams)

1. A hospital purchases a mini-computer network at a cost of $130,000 in 1995 which has a scrap value of $5,000 in 2005. Assuming the value of the computer depreciates linearly, what is the rate of depreciation in dollars per year?
   
   (a) 0.00008
   (b) 125,000
   (c) 500
   (d) 13,000
   (e) 12,500

2. The cost (in thousands of dollars) for producing $x$ thousands of blenders is given by $C(x) = x^2 + 5x + 4$. How many blenders must be produced to minimize average cost?
   
   (a) no minimum
   (b) 9,000
   (c) 2,500
   (d) 2,250
   (e) 2,000

3. The weekly revenue for the movie *Dancer, Texas Population 81* decreased 16% each week. If the first week's revenue was $88,000, which of the following gives the revenue $y$ as a function of $x$, the number of weeks the movie had run prior to the current (i.e., $x = 0$ corresponds to week 1)?
   
   (a) $y = 88,000(0.84)^x$
   (b) $y = 88,000(0.16)^x$
   (c) $y = 0.16x + 88,000$
   (d) $y = 0.84x + 88,000$
   (e) $y = 88,000x + 0.16$

4. Which of the following describe how the graph of $y = \log_2(x + 12) + 18$ is shifted from the graph of $y = \log_2(x)$?
   
   (a) up 18, right 12
   (b) up 12, left 18
   (c) up 12, right 18
   (d) up 18, left 12
   (e) down 18, right 12
5. Which of the following is NOT true?

(a) \( \log(xy) = \log(x) + \log(y) \)
(b) \( \log(x) - \log(y) = \log(x-y) \)
(c) \( \frac{\log(x)}{\log(y)} = \log(x) - \log(y) \)
(d) (a), (b), and (c) are all true
(e) both (b) and (c) are not true

6. The data below gives the average cost \( y \) for producing \( x \) thousand pair of shoes. What is the average rate of change in \( y \), in dollars per thousand pair of shoes, from 7 to 19 thousand pair of shoes?

<table>
<thead>
<tr>
<th>( x )</th>
<th>4</th>
<th>7</th>
<th>17</th>
<th>19</th>
<th>27</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>110</td>
<td>75</td>
<td>67</td>
<td>55</td>
<td>45</td>
<td>60</td>
</tr>
</tbody>
</table>

(a) −1.67
(b) 5
(c) −1.33
(d) −0.6
(e) −0.75

7. On the graph below, which of the following is the largest quantity?

(a) 0
(b) the average rate of change from B to D
(c) the average rate of change from A to B
(d) the instantaneous rate of change at B
(e) the instantaneous rate of change at C

8. Market studies show that 1 thousand bottles of allergy medicine can be sold at $10/bottle, while 5 thousand bottles can be sold at $7/bottle.

(a) Find the demand equation.
(b) If the supply equation is given by \( p = 0.8x + 1 \), find the equilibrium quantity and price.
9. Find the derivative of \( f(x) = x^2 - 4x \).

10. The demand for lawn chairs is given by \( p = -0.25x + 55 \), where \( p \) is the price in dollars and \( x \) is the number of chairs. If the cost \( C \) is given by \( C(x) = 15x + 500 \), find the profit function and the number of chairs needed to maximize profit.

11. Find the effective rate of an account which earns 7\% per year compounded continuously.

12. A mutual fund earns 10\% per year compounded monthly. How long will it take for an initial investment to triple?
13. An account with an initial deposit of $1000 at 6% per year compounded monthly will grow to 
\[ A(t) = 1000(1.005)^{12t}, \] 
where \( A \) is in dollars and \( t \) is the number of years after starting the account. Find the average rate of change from:

(a) 2 to 2.1 years
(b) 2 to 2.001 years

(c) Estimate how fast the account is growing after 2 years. Include appropriate units on all answers.

14. The graph of a function \( f \) is shown below. Sketch the graph of the derivative of \( f (f') \) on the same axes.