Exam 3 M119 Fall 2002 C. Judge

Last Name:												
First Name												

Directions: This exam consists of 11 multiple choice questions. For each multiple choice question, circle the letter below that corresponds to the **best** choice. **To receive credit**, your answer **must appear on this cover page**.

Multiple choice answers:

1) A B C D E
2) A B C D E
3) A B C D E
4) A B C D E
5) A B C D E
6) A B C D E
7) A B C D E
8) A B C D E
9) A B C D E
10) A B C D E
11) A B C D E

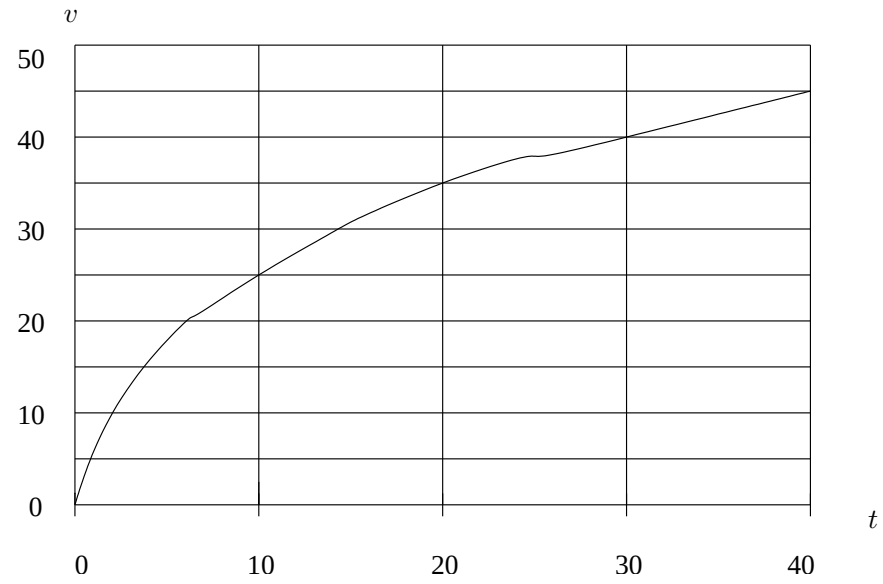

FIGURE 1. Velocity of a missile in miles per second.

(1) The figure above shows the velocity, $v(t)$, in miles per second, of a missile t seconds after it is launched. Underestimate and overestimate the total distance traveled during the first 40 seconds of the flight using 4 subintervals of equal length.

A. The distance is at least 1000 miles and at most 1850 miles.
B. The distance is at least 1000 miles and at most 1450 miles.
C. The distance is at least 800 miles and at most 1850 miles.
D. The distance is at least 800 miles and at most 1450 miles.
E. None of the above.

(2) If the function $f(x) = ax \cdot e^{b \cdot x}$ has a local maximum at $(1, -1)$, then

A. $a = -e$ and $b = 1$.
B. $a = 1$ and $b = -e$.
C. $a = e^{-1}$ and $b = -1$.
D. $a = -1$ and $b = e^{-1}$.
E. None of the above.

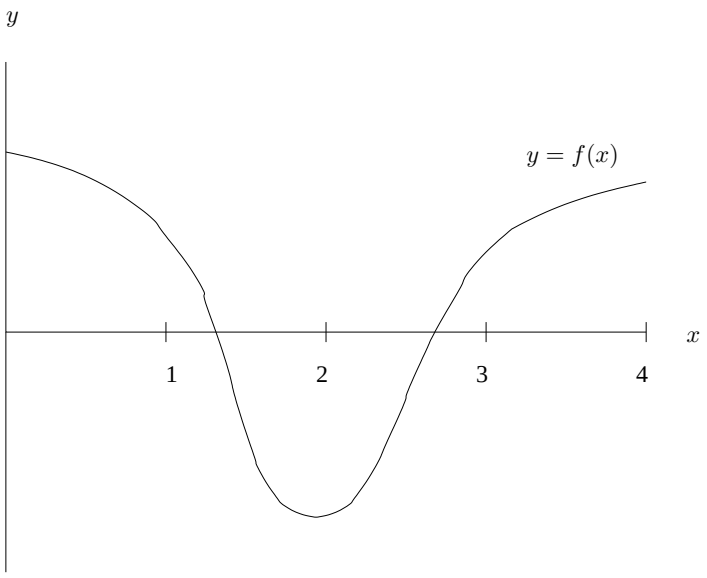

FIGURE 2. The graph of the function f.

(3) Let f be the function whose graph appears in the figure above. The definite integral

A. $\int_2^3 f(x)dx$ is positive.
B. $\int_1^2 f(x)dx$ is greater than $\int_3^4 f(x)dx$.
C. $\int_1^4 f(x)dx$ is less than $\int_1^3 f(x)dx$.
D. $\int_1^3 f(x)dx$ is negative.
E. None of the above is true.

(4) The following table represents a function g.

t	0	2	4	6	8	10
$g(t)$	15	25	34	0	-4	-9

Use left and right sums to find the best estimate of $\int_0^{10} g(t)dt$.

A. 125
B. 110
C. 105
D. 116
E. None of the above is a reasonable estimate.

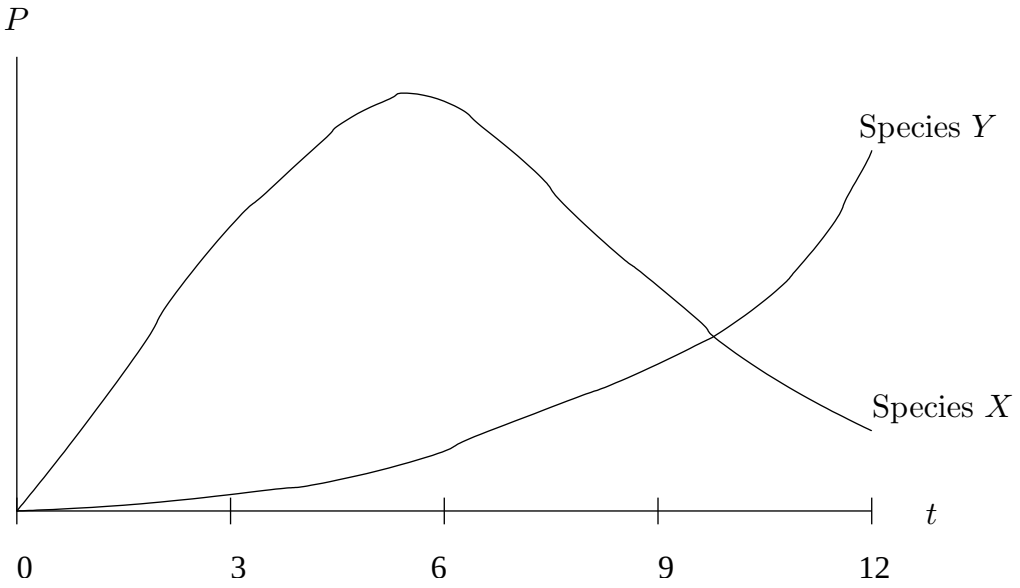

FIGURE 3. Rates of growth of two plant species, species X and species Y.

(5) The yearly rates of population growth of two plant species are given in the figure above. Assuming that the two populations were equal at the beginning of year 0, which of the following must be true?

A. The population of species X is larger at the beginning of the 6^{th} and 12^{th} years.
B. Species X has a larger population at the beginning of the 6^{th} year but a smaller one at the beginning of the 12^{th} year.
C. Species Y has a larger population at the beginning of the 6^{th} year but a smaller after the 12^{th} year.
D. The population of species Y is larger at the beginning of the 6^{th} and 12^{th} years.
E. None of the above statements applies.

(6) To make q violins in a year, a violin maker incurs costs of $100,000 + 1,000 \cdot q + 10 \cdot q^2$ dollars. Due to limited resources, she can make at most 10 violins per year. If she can sell each violin that she makes for \$2000, then she maximizes yearly profit when she produces

A. no violins.
B. 10 violins.
C. 50 violins.
D. 100 violins.
E. None of the above.

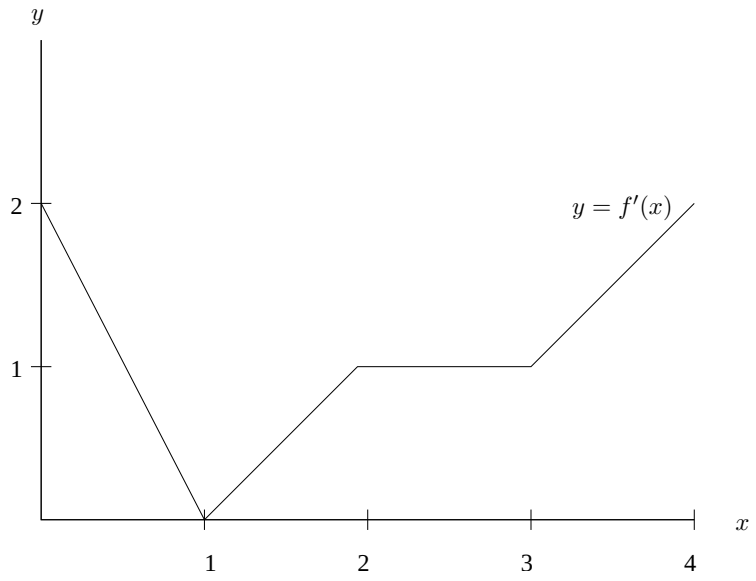

FIGURE 4. The graph of the **derivative**, f'.

(7) The graph of the **derivative**, f', of a function f is given in the figure above. If $f(0) = -1$. then $f(4)$ equals

A. 1
B. 2
C. 3
D. 4
E. None of the above.

(8) For $f(x) = 2x - 3\ln(x)$, and $0.1 \leq x \leq 2$, which of the following statements is true?

A. $f(x)$ has a global maximum at $x = \frac{2}{3}$ and a global minimum at $x = 2$.
B. $f(x)$ has a global maximum at $x = 0.1$ and a global minimum at $x = \frac{3}{2}$.
C. $f(x)$ has a global maximum at $x = 2$ and a global minimum at $x = 0.1$.
D. $f(x)$ has global maximum at $x = 2$ and a global minimum at $x = \frac{1}{6}$.
E. None of the above statements is true.

(9) Let P be a logistic function that grows fastest when t is approximately 6.9 and $P(t)$ is approximately 2.5. Which of the following formulas could describe the function P.

A. $P(t) = \frac{5}{1+4e^{-0.1t}}$
B. $P(t) = \frac{13.8}{1+4e^{0.018t}}$
C. $P(t) = \frac{13.8}{1+4e^{-0.018t}}$
D. $P(t) = \frac{5}{1+4e^{-0.2t}}$
E. None of the above could describe P.

(10) The concentration of a drug t hours after administering a 10 mg dose is given by $C = 25t \cdot e^{-0.3t}$ ng/ml. If the minimum effective concentration is 15 ng/ml, which of the following statements is correct.

A. The second 10 mg dose of the drug should be given when t is approximately 9 hours if it is supposed to be administered when the first dose has become ineffective.
B. The second 10 mg dose shoud be given when t is approximately 3 hours if one desires the onset of effectiveness of second dose to coincide the termination of effectiveness of first dose.
C. The maximum concentration of the first dose occurs when t is approximately 11 hours.
D. If the second dose is administered when the the first dose becomes ineffective, then the concentration of the second dose reaches a peak when t is approximately 4 hours.
E. None of the above.

(11) The following table represents the **derivative**, Q', of a function Q.

t	-3	-2	-1	0	1	2	3
$Q'(t)$	1.1	1.2	-0.7	-1.1	0.3	1.2	1.4

Which of the following statements is true?

A. Q has a local maximum on the interval $[-3, -2]$ and a local minimum on the interval $[-1, 0]$.
B. Q has a local maximum on the interval $[-2, -1]$ and a local minimum on the interval $[0, 1]$.
C. Q has a local maximum on the interval $[-1, 0]$ and a local minimum on the interval $[-3, -2]$.
D. Q has a local maximum on the interval $[0, 1]$ and a local minimum on the interval $[-2, -1]$.
E. None of the above.