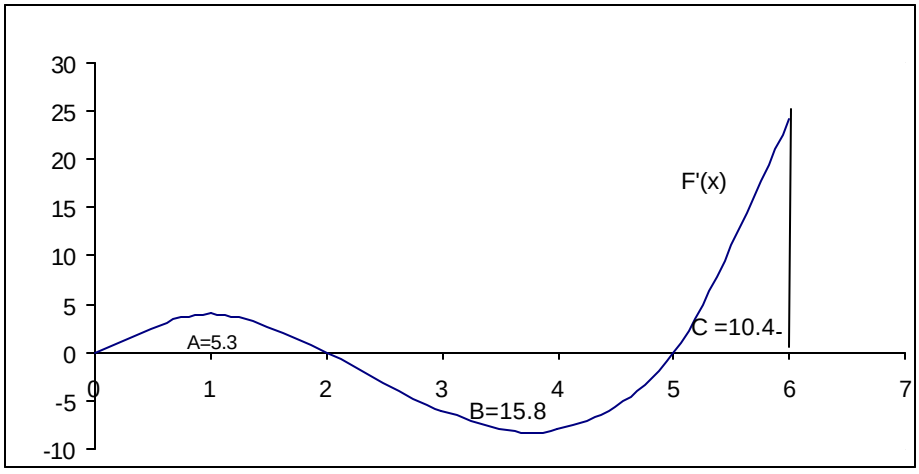
MATH 160 Final, Spring 2001

Name:

1.The graph of the derivative F' of a function F is given in the attached figure with some areas labeled, A, B and C. If $F(0) = 10$ sketch the graph of F. Give the xy-coordinates for all the local maxima and minima of F. Also mark with $\times$ on the graph of F' the points that correspond to the points of inflection of F .

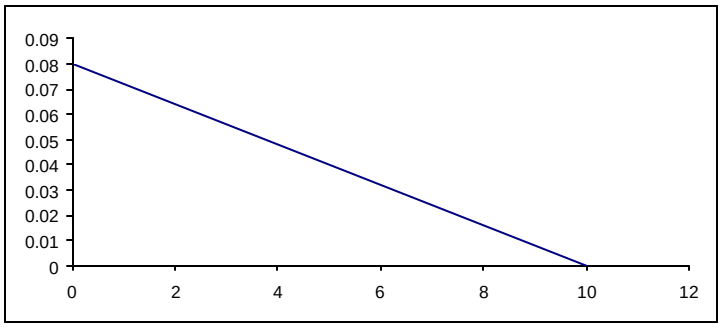


2.a. Evaluate the improper integral $\int_1^{\infty} x^{-\frac{5}{4}} dx$ if possible.

b. Evaluate the definite integral $\int_0^1 e^{-.5t} dt$ without using the calculator.

c. Find the indefinite integral $\int (1 - \frac{1}{\sqrt{x}} + \frac{1}{x}) dx$

3. The graph of the relative growth of a population is given in the attached graph. By approximately what percentage does the population change over the 10year period?



4. Find the equation of the line tangent to the graph of $y = \sqrt{9 + x^2}$ at $x = -4$

5. A certain community has available a fixed area of land. The proportion, P, of land in use for farming *t* years after 1940, is modeled with the logistic function $P(t) = \frac{1}{1+1.5e^{-.0275t}}$.

a. What proportion of land was in use for farming in 1940?

b. What is the long run prediction of this model?

c. When was half of the land in use?

d. When is the proportion of land used for farming increasing most rapidly?

6. a. If *C(q)* represents the cost of producing *q* units what does the marginal cost $C'(q)$ represent?

b. If marginal cost is given by $C'(q) = \frac{6}{10}q^2 - 60q + 5000$ and fixed cost is *C(0)* =100,000 find the total cost of producing 100 units.

7. The quantity Q of a certain radioactive substance at time t, is given by $Q(t) = 5e^{-.041t}$ grams.

a. Find $Q(10)$ and $Q(20)$

b. Find the average value of $Q(10)$ and $Q(20)$.

c. Find the average value of $Q(t)$ over the interval $10 \le t \le 20$.

d. Find the average rate of change of $Q(t)$ from t =10 to t = 20.

e. Find the instantaneous rate of change of $Q(t)$ at $t = 15$

f. Find the relative rate of change of $Q(t)$ at t = 10.

8. Let $f(x) = x^3 - 3x^2$.

a. Use the calculus to find the critical points of *f(x)* and give the xy-coordinates of the local maxima and minima of *f(x)*.

b. Find the global maxima and minima of $f(x)$ over the interval $1 \le x \le 4$.

9. Values *f(t)* of a function are given by the following table. Respond to the requests below.

t	0	5	10	15	20	25
$f(t)$	12	13	14	16	20	30

a. Estimate $f'(12)$

b. Estimate $\int_0^{25} f(t)dt$ and interpret the integral if *t* is in seconds and *f(t)* is velocity in meters/sec.

10. Find $\frac{dy}{dx}$ if $y = x^4 \ln(x)$

11. If $f(x) = \frac{2^x}{x^2 + 1}$ find $f'(0)$.

12. You have invested a certain amount **P** of money at 7% compounded continuously, approximately how long will it take for the money to double?

13. A company producing jigsaw puzzles has fixed cost of $ 6000 and variable cost of $ 3 per puzzle. The company sells puzzles for $ 6 each. Find formulas for the cost function C(q), the revenue function R(q) and the profit function P(q).