

Math 77
Midterm 2

Name _____ SSN _____ Fall
2004

Show your work, the right solution without explanation is useless. Be clean and organized, it is your responsibility to make yourself understood. No graphic calculators. If you did not bring your calculator, you will have to do the exam without it, sharing calculators is not allowed. Good luck!!!

1. Find the derivatives for the following functions:

(a) $f(x) = \frac{x^2 + 1}{x^2 - 1}$

Answer _____

(b) $g(x) = \sqrt{\ln x + 5}$

Answer _____

(c) $h(x) = \frac{e^{-x}}{1+x^3}$

Answer _____

2. Find the derivatives for the following functions:

(a) $i(x) = \cos(x^2 + 1)$

Answer _____

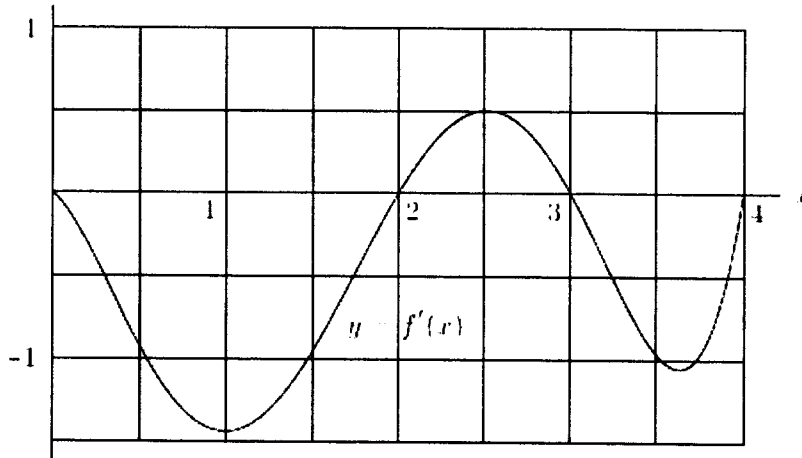
(b) $j(x) = 5^x x^{-5}$

Answer _____

(c) $k(x) = \sin\left(\frac{1}{x}\right)$

Answer _____

3. Below is the graph of the *derivative* of a function f , i.e., it is a graph of $y = f'(x)$:



(a) State the intervals on which f is increasing and on which it is decreasing

Answer _____

(b) Say where the local maxima and minima of f occur, and for each one say whether it is a local maximum or a local minimum. Assume that f' is positive for $x > 4$ and $x < 0$. (don't guess. Explain)

Answer : Local Max _____

Local Min _____

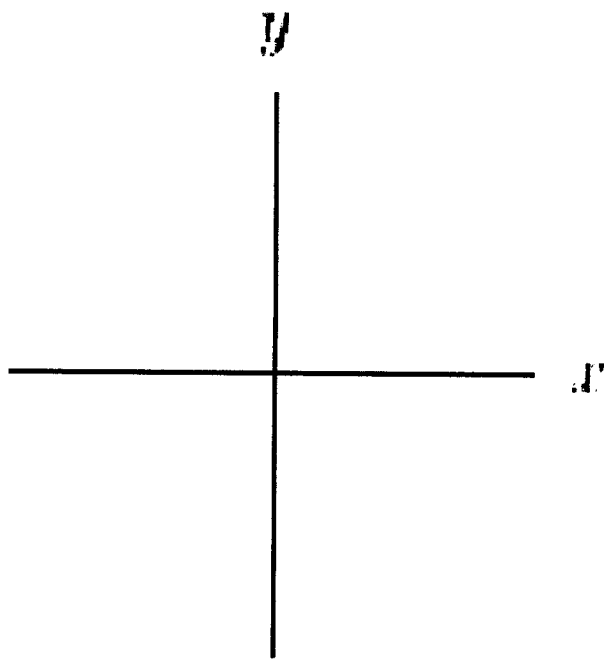
- (c) Where in the interval $2 \leq x \leq 3$ does f achieve its global maximum?
(don't guess. Explain)

Answer _____

- (d) Suppose that you are told that $f(0) = 1$. Estimate $f(2)$, use the fundamental theorem of calculus and the area of the graph for $0 \leq x \leq 2$.

Answer _____

4. Given $f(x) = x^4 - 4x^3 - 8x^2 + 1$ on the interval $[-5, 5]$, find all the maxima and minima and points of inflection. Use this information to sketch the curve:



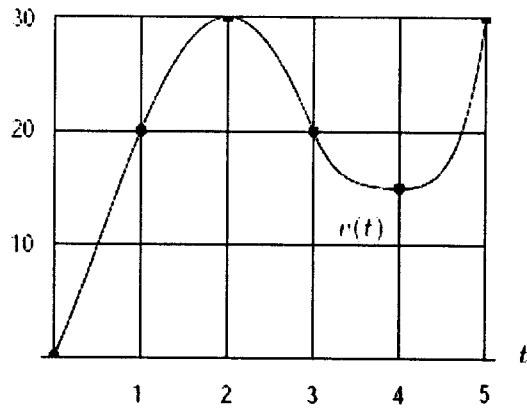
Answer :

Local Max:

Local Min:

Inflection Points:

5. The graph shown below is that of the velocity of an object (in meters/second).



- (a) Find an estimate of the total distance traveled from $t=0$ to $t=5$ seconds.
Hint: Use the Left Hand Sum and the Right Hand Sum

Answer _____

(b) At what times is the acceleration zero?

Answer _____

6. Suppose $A =$ the area under the curve $y = e^{-x^2}$ over the interval $-1 \leq x \leq 1$. Which of the following is true? (don't guess. Explain)

(a) $A = F(1) - F(-1)$, where $F(x) = \frac{e^{-x^2}}{-2x}$.

(b) $1.5 < A$.

(c) $1.4 < A < 1.5$.

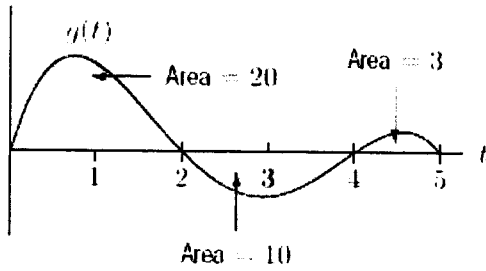
(d) $A < 1.4$.

Hint: Check if (a) can be the answer, if not since the function is positive find the Left Hand Sum and the Right Hand Sum, use that information to estimate

$$\int_{-1}^1 f(x) dx.$$

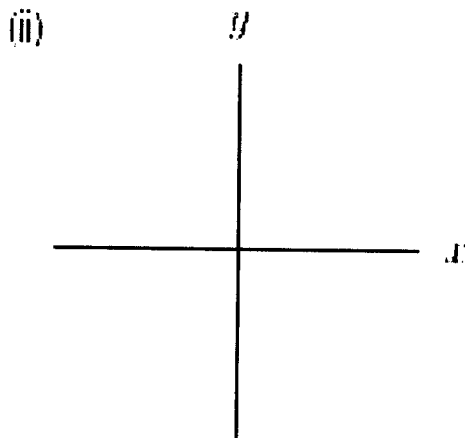
Answer _____

7. Using the information of the graph below, sketch 2 graphs of antiderivatives $G_1(t)$ and $G_2(t)$ of $g(t)$ satisfying $G_1(0) = 10$ and $G_2(0) = -5$. Label each critical point with its coordinates.

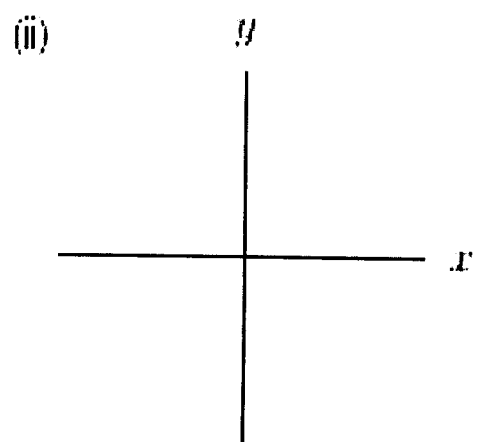


Answer:

Graph of $G_1(t)$



Graph of $G_2(t)$



10. Find the average value of $f(x) = x^3 - 5x^2 + 4x$ in the interval $[0,3]$

Answer: Average _____