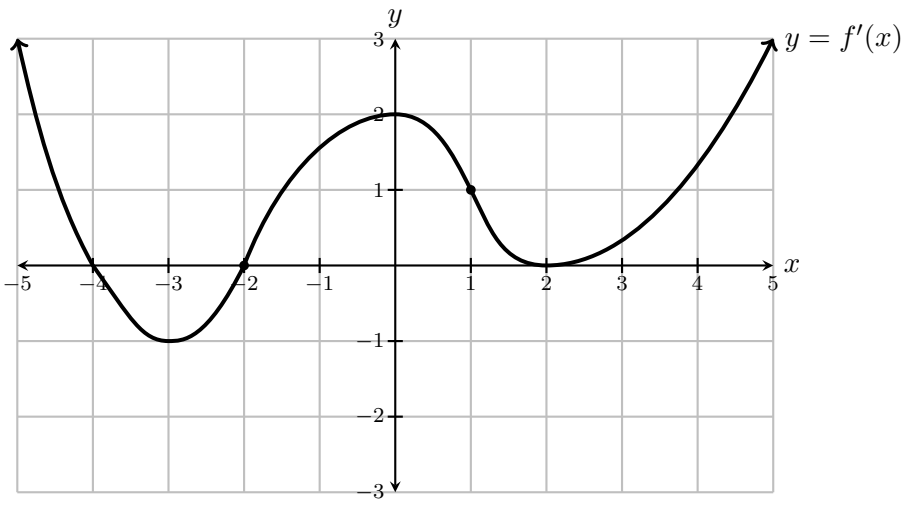
Name: _____ MATH 200 – TEST 3 ☜

I'm in the Thurs11 Thurs12 Thurs1 or Fri10 recitation (Circle one) November 19, 2012

1. (10 pts.) The graph $y = f'(x)$ of **the derivative** of a function $f(x)$ is shown. Answer the questions about $f(x)$.



(a) State the intervals on which the function $f(x)$ increases.

(b) State the intervals on which the function $f(x)$ decreases.

(c) State the intervals on which the function $f(x)$ is concave up.

(d) State the intervals on which the function $f(x)$ is concave down.

(e) Suppose $f(0) = 0$. Using the above information (and coordinate axis), sketch the graph of $f(x)$.

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2. (15 pts.) Find and identify all relative extrema of the function $f(x) = 3x^4 - 8x^3 + 6x^2 + 1$ on the interval $\mathbb{R} = (-\infty, \infty)$. State the extrema in coordinate form (x, y).

3. (15 pts.) US Postal Service regulations state that the length plus girth of a package cannot exceed 108 inches. You must mail a package whose width and height are equal, and with the greatest possible volume. Find the dimensions of the package.

Answer:

length = _____

width = height = _____

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4. (20 points) Evaluate the following limits.

(a) $\lim_{x \to \pi} \dfrac{(x-\pi)^2}{1+\cos x} =$

(b) $\lim_{x \to 0^+} x \ln x =$

5. (24 points) Find the indicated indefinite integrals.

(a) $\int \frac{2x}{x^2}\, dx =$

(b) $\int \left(x^2 + \sqrt[3]{x^2} \right) dx =$

(c) $\int \left(4e^{-x} + \sin x + 3 \right) dx =$

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6. (8 pts.) Is the equation $\int (1 + \ln x)\, dx = x \ln x + C$ true or false? Justify your answer.

7. (8 pts.) Suppose $f(x)$ is a function for which $f'(x) = \cos(x)$, and $f(3\pi/4) = 2$. Find $f(x)$.