Math 119 Name:____________________

Exam III Instructor:____________________

April 14, 1997 Section:____________________

Where on the interval $(0, 2\pi)$ is the graph of

$$f(x) = x^2 + \sin x$$

concave up? on $(0, 2\pi)$ nowhere on $(0, \pi)$ on $(0, \frac{\pi}{2})$ and $(\pi, \frac{3\pi}{2})$ on $(\frac{\pi}{2}, \pi)$ and $(\frac{3\pi}{2}, 2\pi)$

Which of the following is true? if $f(-x) = f(x)$, then f is symmetric around y-axis if f has an absolute minimum value at c, then $f'(c) = 0$ if $f''(c) = 0$, then $(c, f(c))$ is an inflection point of the curve $y = f(x)$ if $f'(x) = g'(x)$ for $0 < x < 1$, then $f(x) = g(x)$ for $0 < x < 1$. $\sum_{i=1}^{n} a_i b_i = \left(\sum_{i=1}^{n} a_i\right)\left(\sum_{i=1}^{n} b_i\right)$

How many real roots does the quartic equation $x^4 + 10x^2 + 21$ have? none 1 2 3 4

Find $f(x)$ if $f'(x) = \sec x \tan x$ and $f(0) = 0$. $\sec x - 1$ $-\sec x \tan x$ $\sec x \tan x$ $\sec x + 1$ $\tan x$

Find $\lim_{x\to\infty}(\sqrt{x^2 + x + 1} - \sqrt{x^2 - x})$. 1 -1 0 2 does not exist

Find all the points on the hyperbola $y^2 - x^2 = 4$ which are closest to the point $(2, 0)$. $(1, \pm\sqrt{3})$ $(1, \sqrt{3})$ $(0, 1)$ $(\sqrt{2}, 1)$ $(-\sqrt{3}, 1)$

Given that the graph of f passes through the point $(1, 2)$ and the slope of its tangent line at $(x, f(x))$ is $2x - 1$, find $f(0)$. 2 -2 0 $\frac{1}{2}$ $-\frac{1}{2}$

Which of the following lines are vertical asymptotes of the graph of $y = \tan 2x$? $x = -\frac{\pi}{4}$ and $x = \frac{\pi}{4}$ $y = 0$ $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$ $x = 0$ $x = -\pi$ and $x = \pi$

An open-top box with a square base is to be made in such a way that its volume equals 4 cubic feet. Let S stand for the total surface area of the box. Which of the following statements is true? There is a minimum possible value for S, but not a maximum. There is a maximum possible value for S, but not a minimum. There are both minimum and maximum possible values for S. There is neither a minimum nor a maximum possible value for S. More information is needed to determine if there are minimum and/or maximum possible values for S.

Calculate $\sum_{k=0}^{4} \cos\frac{k\pi}{2}$ 1 $1 + \frac{\sqrt{3}}{2}$ -1 0 $\frac{1}{2}$

Find $\lim_{x\to\infty} x \sin(1/x)$. 1 0 -1 undefined because it approaches ∞ undefined because it approaches $-\infty$

Find all the horizontal and vertical asymptotes of $y = \frac{\sqrt{x^2-9}}{2x-6}$. $y = \pm\frac{1}{2}, x = 3$ $y = \frac{1}{2}, x = -3$ $y = -\frac{1}{2}, x = -3$ no horizontal asymptote, $x = 3$ no horizontal or vertical asymptotes

Find a description which is **false** for a curve $y = f(x)$ having the following characteristic (assume the domain of f is $(-\infty, \infty)$) :

$$f'(2) = f'(-2) = 0$$
$$f'(x) > 0 \quad \text{for} \quad |x| > 2$$
$$f'(x) < 0 \quad \text{for} \quad |x| < 2$$
$$f''(x) < 0 \quad \text{for} \quad x < 0, \qquad f''(x) > 0 \quad \text{for} \quad x > 0$$
$$f(-2) = 8, f(0) = 4, f(2) = 0$$

increasing on $[-2, 2]$ $x = 0, y = 4$ is an inflection point of f CD on $(-\infty, 0)$ CU on $(0, \infty)$ $x = \pm 2$ are critical points of f

What is the general antiderivative of $f(x) = \frac{x^2+x}{x^{3/2}}$. $\frac{2}{3}x^{3/2} + 2x^{1/2} + C$ $\frac{3}{2}x^{3/2} + 2x^{1/2} + C$ $\frac{2}{3}x^{3/2} - 2x^{1/2} + C$ $x^{3/2} - 2x^{1/2} + C$ $\frac{2}{3}x^{1/2} + 2x^{-1/2} + C$

Partial Credit An athletic field is to be built in the shape of a rectangle with a semi-circle attached to the east and west ends, as shown in the picture. The outer boundary is to be used as a race-track and is to be 2 miles long. What is the largest possible area of the rectangular part (shaded in the picture)?

Note: If your answer involves a rational number, such as π, or $\sqrt{2}$, leave it in that form.

Partial Credit Sketch the graph of the curve $y = |x^2 - 3|$.

That's all folks!