Brief Article

The Author

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Math 119: Calculus Name:____________________________ **Exam II** Tutorial

Instructor:____________________________ *October 31, 1995* Tutorial

Section:____________________________

Calculators are not allowed. Hand in this answer page only. Record your answers to the multiple choice problems by placing an $\times$ through one letter for each problem on this answer sheet. There are 19 multiple choice questions, worth 5 points each. An additional 5 points will be given for your correct tutorial section number.

You are taking this exam under the honor code.

let $f(x) = \sin x + \cos x$. Find all values of x between 0 and 2π, inclusive, where the tangent line to the graph of $f(x)$ is horizontal. $x = \frac{\pi}{4}, \frac{5\pi}{4}$ $x = \frac{3\pi}{4}, \frac{7\pi}{4}$ $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ $x = 0, \pi, 2\pi$ $x = \frac{\pi}{2}, \frac{3\pi}{2}$

Let $f(x) = \tan(x^2 + 1)$. Find $f'(x)$. $2x\sec^2(x^2+1)$ $\sec^2(x^2+1)$ $\sec^2(2x)$ $\tan(2x)\cdot\sec^2(x^2+1)$ $\sec^2(x^2+1) + \tan(2x)$

If $xy + 1 = y^2$, use implicit differentiation to find $\frac{dy}{dx}$. $\frac{-y}{x-2y}$ $\frac{x+y}{2y}$ 0 $\frac{y}{x}$ $\frac{-y-1}{x-2y}$

Let $f(x) = \sin x$. Find the one hundredth derivative $f^{(100)}(x)$. $\sin x$ $\cos x$ $-\sin x$ $-\cos x$ $(100!)\cdot\sin x$

Let $f(x) = x^{10} + x^5 + 3$. Find $f^{(10)}(x)$. $10!$ $10! + 5!$ $10! + 5! + 3!$ 0 $10! + 5! + 3$

If a ball is thrown vertically upward with a velocity of 16 ft/sec, then its height after t seconds is $s = 16t - 16t^2$. What is the maximum height reached by the ball? 4 ft. 0 ft. 16 ft. 8 ft. 32 ft.

The equation of motion for a certain particle is $s = t^4 - t^2 + 1$. What is the equation for the acceleration of the particle? $12t^2 - 2$ $12t^2$ $4t^3 - 2t$ $24t$ $4t^3 - 2t + 1$

Dave is standing at the edge of a canal directly across from point A. The canal is 8 feet across.

Mary is walking along the canal, away from point A, at a rate of 5 ft/sec. When she is 6 ft away from point A, at what rate is the distance between Dave and Mary increasing?

3 ft/sec 4 ft/sec 2 ft/sec 1 ft/sec 5 ft/sec

A spherical snowball is melting in such a way that its volume is *decreasing* at a rate of 4 cm^3/min. Recall that the formula for the volume of a sphere is

$$V = \frac{4}{3}\pi r^3$$

where V is the volume and r is the radius of the sphere. Find $\frac{dr}{dt}$ at the moment when $r = 5$ cm. (Hint: don't forget that the snowball is getting smaller.) $\frac{-1}{25\pi}$ $\frac{1}{25\pi}$ $\frac{3}{125\pi}$ $\frac{-3}{125\pi}$ $\frac{-1}{125\pi}$

Let $f(x) = x^3 - 12x$. Find the absolute maximum value of $f(x)$ on the interval $[0, 3]$. (You are looking for a y-value, not an x-value.) 0 -9 -16 16 2

Let

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

Find (all) the critical numbers of $f(x)$, if there are any. $x = -1, 1$ $x = 1$ $x = -1$ there are no critical numbers $x = 0$

Let $f(x) = 5x^{2/3} + x^{5/3}$. It happens to be true that

$$f'(x) = \frac{10 + 5x}{3x^{1/3}}$$

Find the value(s) of x, if any, where $f(x)$ has a local minimum $x = 0$ $x = -2, 0.$ $x = -2$ $x = 2$ $f(x)$ has no local minimum

Let $f(x) = x^4 - 6x^2$. Find the interval(s) where $f(x)$ is concave up. $(-\infty, -1) \cup (1, \infty)$ $(-1, 1)$ $(-\infty, 1)$ $f(x)$ is concave up everywhere $f(x)$ is not concave up anywhere

Consider the curve $x = y^2$. Find the slope of the tangent line at the point $(4, 2)$. $\frac{1}{4}$ 4 $\frac{1}{8}$ 8 $\frac{1}{2}$

Let

$$f(x) = \frac{1}{4}x^4 - \frac{1}{3}x^3 + 5.$$

Find *all* the local extrema of $f(x)$. local minimum at $x = 1$ local maximum at $x = 0$, local minimum at $x = 1$ local minimum at $x = 0$, local maximum at $x = 1$ there are no local extrema local minimum at $x = 0$, local minimum at $x = 1$

Let $f(x) = \frac{1}{2}x^2 + \sin x$. Find the inflection points, if any, of $f(x)$ in the range $0 \leq x \leq 2\pi$. there are no inflection points $x = \frac{\pi}{2}, \frac{3\pi}{2}$ $x = \frac{\pi}{2}$ $x = \frac{\pi}{2}, \pi, \frac{3\pi}{2}$ $x = \frac{3\pi}{2}$

Let $f(x) = \sqrt[3]{x^4 - x}$. Find $f'(x)$. $\frac{4x^3 - 1}{3(x^4 - x)^{2/3}}$ $\frac{1}{3(x^4 - x)^{2/3}}$ $\frac{3(4x^3 - 1)}{(x^4 - x)^{2/3}}$ $\frac{(x^4 - x)^{2/3}}{4x^3 - 1}$ $\frac{4(x^3 - 1)}{3(x^4 - x)^{2/3}}$

Consider the curve $4x^2 + y^2 = 4$. It is a fact that

$$\frac{dy}{dx} = -4 \cdot \frac{x}{y}$$

Using this fact, find all the points on the curve where the tangent line is horizontal. $(0, 2)$ and $(0, -2)$ $(1, 0)$ and $(-1, 0)$ $(0, 2)$ $(1, 0)$ $(0, 0)$

An inverted conical tank has radius 4 meters and height 10 meters. It is being filled with water at a rate of 8 m^3/min. How quickly is the water rising when the tank is half full (i.e. when the height of the water reaches 5 meters)? Recall that the formula for the volume of a cone of radius r and height h is $V = \frac{1}{3}\pi r^2 h$.

$\frac{2}{\pi}$ $\frac{4}{\pi}$ $\frac{\pi}{3}$ $\frac{\pi}{10}$ 6π