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Math 105   Test 1 September 24, 1996 p.6 I have observed the honor code

If $f(x) = 2^x$, which of the following limits is equal to $f'(0)$? $\lim_{h\to 0} \frac{2^h-1}{h}$ $\lim_{h\to 0} 2^h$ $\lim_{h\to 0} h2^{h-1}$ $\lim_{h\to 0} \frac{2^h}{h}$ $\lim_{h\to 0} \frac{2^h+1}{2}$ 1:edcba 2:baced

If $f(x) = \frac{x}{x-3}$, for which value(s) of x does $f(x)$ have relative extrema? none $x = -1$ and $x = -3$ $x = 0$ $x = 1$ $x = 3$ 1:bacde 2:cdbea

Suppose $y = e^x$ and $x = t^2$. Find $\frac{dy}{dt}$ when $t = 10$. $20e^{100}$ e^{100} 20 200 $100e^{20}$ 1:cabde 2:debac

Let $f(x) = \frac{\ln x}{x}$. On which of the following intervals is $f(x)$ increasing? $(0, e)$ $(1, 2e)$ $(\ln 2, 4)$ (e, ∞) no interval 1:dbace 2:edcba

Calculate $\int_1^2 x^3 dx$. 15/4 13/4 11/4 3 4 1:dcbae 2:eabcd

Simplify $\frac{\sqrt{x}}{x^{-2}}$. $x^{5/2}$ $x^{7/2}$ $x^{3/2}$ x^3 x^{-3} 1:dcabe 2:adbec

If $f(x) = x + \frac{1}{x}$ for $x > 0$, the first and second derivatives are as follows:

$$f'(x) = \frac{(x-1)(x+1)}{x^2} \qquad \text{and} \qquad f''(x) = \frac{2}{x^3}.$$

Which of the following might be the graph of f? (Use the letter to the lower left of the correct picture.)
1.75in by 1.75in (newgraph1 scaled 450) 1.75in by 1.75in (newgraph2 scaled 450) 1.75in by 1.75in (newgraph3 scaled 450) 1.75in by 1.75in (newgraph4 scaled 450) 1.75in by 1.75in (newgraph5 scaled 450) 1:bdeac 2:cbade

Find the derivative of $f(x) = x^2 + \frac{1}{x^2}$. $2x - \frac{2}{x^3}$ $2x + \frac{2}{x^3}$ $2x - \frac{2}{x}$ $2x + \frac{2}{x}$ $x - \frac{1}{x}$ 1:bceda 2:adecb

Solve for x: $\left(2^x 2^{-3}\right)^2 = 2^2$. 4 3 2 5 1 1:dabce 2:ecbad

The growth rate of a certain bacteria culture is proportional to its size. Suppose that the culture contains 10,000 bacteria at noon, and 40,000 bacteria at 2:00 PM. How many bacteria will it contain at 3:00 PM? 80,000 60,000 $10,000 \cdot 2^{3/2}$ $\frac{10,000}{\ln 4}$ 120,000 1:bcade 2:bdeca

Suppose that for a certain value of x,

$$\sin x > 0 \text{ and } \cos x < 0.$$

If

$$0 \le x \le 2\pi,$$

which of the following can you conclude about x?

$\pi/2 \le x \le \pi$ $0 \le x \le \pi/2$ $\pi \le x \le 3\pi/2$ $3\pi/2 \le x \le 2\pi$ There is no x satisfying $\sin x > 0$ and $\cos x < 0$. 1:bacde 2:ebacd

Suppose $f(x) = \begin{cases} 2x - 2 & \text{if } x \neq 0 \text{ and } x \neq 2 \\ 0 & \text{if } x = 2 \\ -2 & \text{if } x = 0 \end{cases}$.

At which points does $f(x)$ fail to be continuous? only $x = 2$ only $x = 0$ only $x = -2$ both $x = 0$ and $x = 2$ none 1:abcde 2:cdabe

Let $f(x) = x^2 + 2x + 3$. Where does $f(x)$ have an inflection point? nowhere $x = 0$ $x = 1$ $x = 2$ $x = 3$ 1:abcde 2:bcdea

Suppose that x and y are related by the equation $y = xy^2 + x$. Find $\frac{dy}{dx}$. $\frac{y^2+1}{1-2xy}$ $y^2 + 1$ $y^2 + 2xy + 1$ $\frac{-y^2-1}{2xy}$ none of the other answers is correct 1:dbace 2:dbcae

Let $y = 2^x$ and compute $\frac{dy}{dx}$. $(\ln 2)2^x$ 2^x $x2^{x-1}$ 0 2 1:bdcea 2:eacbd

What is the radian measure of the angle shown on the right?

$5\pi/2$ $\pi/2$ 3π 5π π 1:abcde 2:cdeba

Find the slope of the graph of $y = \sqrt{x}$ at the point $(9, 3)$. 1/6 1/3 1/2 3 27 1:dbcae 2:aebdc

If $f(x) = \frac{x}{1+x^2}$, what is $f'(x)$? $\frac{1-x^2}{(1+x^2)^2}$ $\frac{1}{2x}$ $\frac{1}{(1+x^2)^2}$ $\frac{1+3x^2}{1+x^2}$ $\frac{1}{1+x^2}$ 1:edcba 2:debac

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Which of the following is equal to $e^{(\ln 3)/2}$? $\sqrt{3}$ $2^{1/3}$ $2^{-1/3}$ $\sqrt{e^3}$ $3/2$ 1:bdeac 2:cadbe

The graph of $y = f(x)$ is shown on the right.

Which of the following statements is true?

$f(x)$ is decreasing and $f'(x)$ is increasing. $f(x)$ is increasing and $f'(x)$ is decreasing. $f(x)$ is increasing and $f'(x)$ is increasing. $f(x)$ is decreasing and $f'(x)$ is decreasing. None of the other statements is true. 1:dabce 2:cbade

A farmer with 800 feet of fencing wants to enclose a rectangular region and then divide it into three pens with fencing parallel to one side of the rectangle (as shown on the right). What is the maximum total area of the region?

20,000 square feet 160,000 square feet 50,000 square feet 10,000 square feet 30,000 square feet 1:cbeda 2:daecb

Find the equation of the line passing through the points $(3, 7)$ and $(2, 2)$. $y = 5x - 8$ $y = 7x - 14$ $y = 7x - 12$ $y = \frac{1}{5}x + \frac{8}{5}$ $y = 5x + 2$ 1:bedac 2:ebcda

The derivative of $(z^4 + 3z^2 + 1)^2$ is $2(z^4 + 3z^2 + 1)(4z^3 + 6z)$ $2(z^4 + 3z^2 + 1)$ $(4z^3 + 6z)$ $(4z^3 + 6z)^2$ $2(4z + 6z)$ 1:abcde 2:deacb

Suppose you put $250 into a bank account that receives 8% annual interest compounded continuously. How many years will it take before your bank account has $1,000? $\frac{\ln 4}{0.08}$ $(0.08) \ln 4$ $\frac{\ln(0.08)}{4}$ $4 \ln(0.08)$ $250e^{0.08}$ 1:bcead 2:abecd

Find the derivative of the function $f(x) = (\sin x)^2$. $2 \sin x \cos x$ $2 \sin x$ $-2 \cos x$ $-(\cos x)^2$ $(\cos x)^2$ 1:abcde 2:deabc

If $f(x) = \begin{cases} \sqrt{x} & \text{if } 0 \le x < 2 \\ 1 + x & \text{if } 2 \le x < \infty \end{cases}$ find the value of the product $f(1) \cdot f(2)$. 3 $\sqrt{2}$ $2\sqrt{2}$ $3\sqrt{2}$ 0 1:edcba 2:cebad

Find the equation of the line tangent to the curve

$$y = 1 + \ln x$$

at the point $(e, 2)$. $y = \frac{x}{e} + 1$ $y = ex + 2$ $ey = x - 2$ $y - 2 = x - e$ $y = ex - 2$ 1:bacde 2:cabed

A ball is thrown up into the air so that its height $h(t)$ after t seconds is given by the formula

$$h(t) = -16t^2 + 128t + 5.$$

Find the maximum height that the ball reaches. 261 256 266 278 237 1:ebacd 2:abcde

Consider the function $f(x) = (8 - 2x)e^{(x+7)}$. Which one of the following statements is true? $x = 3$ gives an absolute maximum. $x = 3$ gives a relative minimum. $x = 4$ gives a relative maximum. The function is everywhere concave down. There are no relative maxima or minima. 1:abcde 2:edcba

If $f'(x) = x^2 + x^{1/2}$ and $f(4) = 80/3$, then $f(1)$ is equal to 1 $1/3$ $2/3$ $4/3$ $8/3$ 1:ebadc 2:bcdae