Quiz 9

ⓘ This is a preview of the published version of the quiz

Started: Nov 10 at 9:24am

Quiz Instructions

This quiz consists of two (2) multiple-choice problems and three (3) problems that require written work. For the problems that require written work, show all work to receive full credit. Submit your written work in one of the formats: pdf, jpg, or png.

Question 1 **3 pts**

Do this problem on paper, using calculus techniques and showing all work. Then submit your solution as a pdf, jpg, or png file.

The product of two positive numbers is 147. The sum of the first number plus three times the second number is a minimum. Find the numbers.

SEE ATTACHED SHEET.

Upload Choose a File

Question 2 **2 pts**

Do this problem on paper, showing all work. Then submit your solution as a pdf, jpg, or png file.

Evaluate the limit: $\lim_{x \to 0^+} \dfrac{e^x - (1+x)}{x^3}$

SEE ATTACHED SHEET.

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Question 3 **3 pts**

Do this problem on paper, showing all work. Then submit your solution as a pdf, jpg, or png file.

Evaluate the limit: $\lim_{x \to 2^+} \left(\frac{8}{x^2 - 4} - \frac{x}{x - 2} \right)$

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Question 4

1 pts

Use Newton's method, starting with $x_0 = -1$, to approximate the solution of the equation $x = \cos x$. Which one of these values is closest to your value of x_2?

- ○ 0.75
- ○ −0.51
- ★ 2.98
- ○ 8.72

$f(x) = X - \cos X = 0$

USE A NEWTON'S METHOD PROGRAM OR ONLINE CALCULATOR

YOU SHOULD GET

$X_0 = -1$

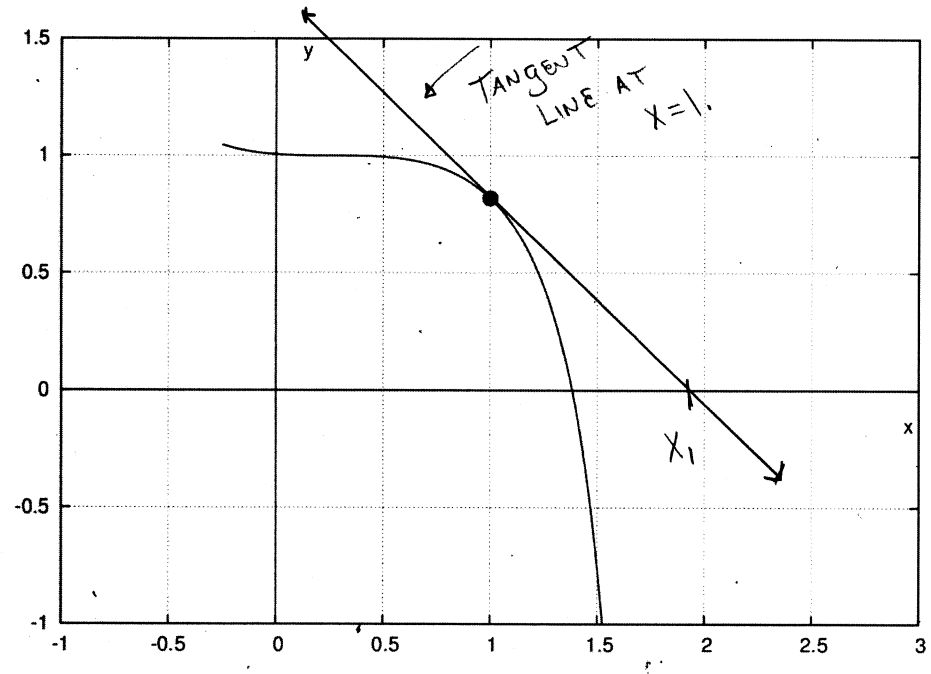
$X_1 = 8.7162169...$

$X_2 = 2.9760660655...$

Question 5

1 pts

The graph of $y = f(x)$ is shown below. Suppose you use Newton's method, starting with $x_0 = 1$, to approximate a solution of $f(x) = 0$. Which one of the following numbers would be closest to x_1?



$X_1 \approx 1.9$

○ 1.35

○ 2.5

✳ 1.9

○ 1.0

Quiz saved at 9:24am Submit Quiz

Quiz 9, Question 1

Let x & y be the two positive numbers.

$$xy = 147$$

Find the minimum value of $x + 3y$.

$$xy = 147 \Rightarrow y = \frac{147}{x}$$

Minimize $f(x) = x + 3\left(\frac{147}{x}\right) = x + \frac{441}{x}$, $x > 0$

$$f'(x) = 1 - \frac{441}{x^2} = 0$$

$$\Rightarrow x^2 = 441 \Rightarrow x = 21 \text{ or } \cancel{x = -21}$$

$$x = 21 \Rightarrow y = \frac{147}{21} = 7$$

How do we know we found the minimum value?

$$f''(x) = \frac{882}{x^3} \Rightarrow f''(21) > 0 \Rightarrow \text{Graph is concave up.}$$

$\Rightarrow$ The crit # gives a min.

The numbers are $x = 21$ & $y = 7$.

Quiz 9, Question 2

Apply L'Hôpital's Rule.

$$\lim_{x \to 0^+} \frac{e^x - (1+x)}{x^3} \quad \%$$

$$= \lim_{x \to 0^+} \frac{e^x - 1}{3x^2} \quad \%$$

$$= \lim_{x \to 0^+} \frac{e^x}{6x} = \boxed{+\infty} \quad \%$$

↑ Fractions are positive for $x > 0$.

Quiz 9, Question 3

$$\lim_{x \to 2+} \left(\frac{8}{x^2-4} - \frac{x}{x-2} \right) \quad \infty - \infty$$

$$= \lim_{x \to 2+} \left(\frac{8}{x^2-4} - \frac{x(x+2)}{x^2-4} \right) \quad \text{Common denom.}$$

$$= \lim_{x \to 2+} \frac{8 - x^2 - 2x}{x^2-4} \quad \%$$

L'Hôpital's rule

$$= \lim_{x \to 2+} \frac{-2x-2}{2x} = \frac{-6}{4} = \boxed{-\frac{3}{2}}$$