

Quiz 8 Calculus 1 10/21/2002

Each problem is worth 5 points. Show complete justification for full credit.

1. Use the derivative to find all local maximum and minimum **values** of $f(x) = x^3 - 6x^2 - 15x + 7$.

$$f'(x) = 3x^2 - 12x - 15$$

$$0 = 3x^2 - 12x - 15$$

$$0 = 3(x^2 - 4x - 5)$$

$$0 = x^2 - 4x - 5 = (x + 1)(x - 5)$$

$$x = -1, 5$$

Excellent

$$f(-1) = (-1)^3 - 6(-1)^2 - 15(-1) + 7 = -1 - 6 + 15 + 7 = 17$$

$$f(5) = 5^3 - 6(5)^2 - 15(5) + 7 = 125 - 150 - 75 + 7 = -93$$

2. Use the derivative to find the **exact x value** where the minimum of $g(x) = x \ln x$ occurs.

$$g(x) = x \cdot \ln x$$

$$g'(x) = 1 \cdot \ln x + x \cdot \frac{1}{x}$$

$$g'(x) = \ln x + 1$$

$$0 = \ln x + 1$$

$$\ln x = -1$$

$$e^{\ln x} = e^{-1}$$

Exactly!

$x = e^{-1}$ is where the minimum of $g(x) = x \ln x$ occurs

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