

Math 131 - Quiz 8 (IC)

March 27, 2023

Name key
Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Find the linearization of $f(x) = \sqrt{x}$ at $x = 4$. Then use your linearization to approximate $\sqrt{3.96}$.

$$f'(x) = \frac{1}{2} x^{-1/2} = \frac{1}{2\sqrt{x}}$$

$$f'(4) = \frac{1}{2\sqrt{4}} = \frac{1}{4}$$

$$f(4) = \sqrt{4} = 2$$

$$L(x) = 2 + \frac{1}{4}(x-4)$$

$$\sqrt{3.96} \approx L(3.96)$$

$$= 2 + \frac{1}{4}(3.96-4)$$

$$= 2 - 0.01$$

$$= \boxed{1.99}$$

2. (2 points) Let $y = e^{-2x}$. Use differentials to approximate Δy as x changes from $x = 0$ to $x = 0.12$.

$$dy = -2e^{-2x} dx$$

$$\Delta y \approx -2e^{-2x} \Delta x$$

$$x=0, \Delta x = 0.12$$

$$\begin{aligned} \Delta y &\approx (-2e^0)(0.12) \\ &= (-2)(0.12) \\ &= -0.24 \end{aligned}$$

$$\Delta y \approx -0.24$$

Math 131 - Quiz 8 (TH)

March 27, 2023

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary. This portion of Quiz 8 is due on April 3.

1. (4 points) Use calculus techniques, showing all work, to find the absolute minimum and maximum values of $f(x) = x^2(x-3)^3$ on $[-1, 4]$.

CRIT. #'s ...

$$f'(x) = 2x(x-3)^3 + x^2(3)(x-3)^2$$

$$= x(x-3)^2 [2(x-3) + 3x]$$

$$= x(x-3)^2 (5x-6) = 0$$

$$x = 0, x = 3, x = \frac{6}{5}$$

END PTS ...

$$x = -1$$

$$x = 4$$

x	f(x)
0	0
3	0
6/5	-8.39808

-1	-64	← ABS MIN
4	16	← ABS MAX

2. (1 point) Suppose that x and y are differentiable functions of t and that $y = 4x^2$. Find dx/dt at $x = 2$ if $dy/dt = 3$.

$$\frac{dy}{dt} = 8x \frac{dx}{dt}$$

$$3 = 8(2) \frac{dx}{dt} \Rightarrow \frac{dx}{dt} = \frac{3}{16}$$