

Quiz 3
 MATH 022, Section 004
 University of California, Riverside
 November 1, 2018

This quiz is worth 15 points. You have 30 minutes to complete the quiz. If you need more space, continue your work on the back side of the page and write "see back" next to your work on the front side of the page accordingly.

(4 pts) 1. Find all relative extrema of $f(x) = \frac{8}{x^2+2}$.

$$f'(x) = \frac{d}{dx} \left(\frac{8}{x^2+2} \right)$$

$$= -\frac{8}{(x^2+2)^2} \cdot \frac{d}{dx}(x^2+2)$$

$$= -\frac{8}{(x^2+2)^2} \cdot 2x$$

$$= -\frac{16x}{(x^2+2)^2}$$

$$f'(x) = 0$$

$$\Rightarrow -\frac{16x}{(x^2+2)^2} = 0$$

$$\Rightarrow -16x = 0$$

$$\Rightarrow x = 0$$

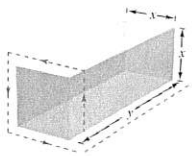
$$f(0) = \frac{8}{0^2+2}$$

$$= \frac{8}{2}$$

$$= 4$$

$(0, 4)$

(4 pts) 2. A rectangular package to be sent by a postal service can have a maximum combined length and girth (perimeter of a cross section) of 108 inches. Find the dimensions of the package with maximum volume. Assume that the package's dimensions are x by x by y , according to the figure below.



length: y
 girth: $x+x+x+x=4x$
 length + girth = 108
 $4x + y = 108$
 $\Rightarrow y = 108 - 4x$

Volume: $V = x \cdot x \cdot y$
 $= x^2 y$
 $= x^2(108 - 4x)$
 $= 108x^2 - 4x^3$

$$V = 108x^2 - 4x^3$$

$$\Rightarrow V' = 216x - 12x^2 = 0$$

$$\Rightarrow 12x(18 - x) = 0$$

$$\Rightarrow 12x = 0, 18 - x = 0$$

$$\Rightarrow x = 0, x = 18 \text{ inches}$$

\hookrightarrow A side cannot have zero length

(3 pts) 3. Find the price that will maximize profit for the demand function $p = 800 - 2x$ and the cost function $C = 300x + 400$.

$$R = xp$$

$$= x(800 - 2x)$$

$$= 800x - 2x^2$$

$$P = R - C$$

$$= (800x - 2x^2) - (300x + 400)$$

$$= 800x - 2x^2 - 300x - 400$$

$$= 500x - 2x^2 - 400$$

$$\Rightarrow P' = 500 - 4x = 0$$

$$\Rightarrow 4x = 500$$

$$\Rightarrow x = 125$$

$$\rightarrow S_o \quad p = 800 - 2 \cdot 125$$

$$= 800 - 250$$

$p = \$550$

(2 pts) 4. Find $\lim_{x \rightarrow 4^+} \frac{1}{x-4}$.

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(3 pts) 5. Find the horizontal asymptote of the graph $f(x) = \frac{4x-3}{2x+1}$.

H.A.: $y = \frac{4x}{2x} = 2$

$y = 2$