

Quiz 3

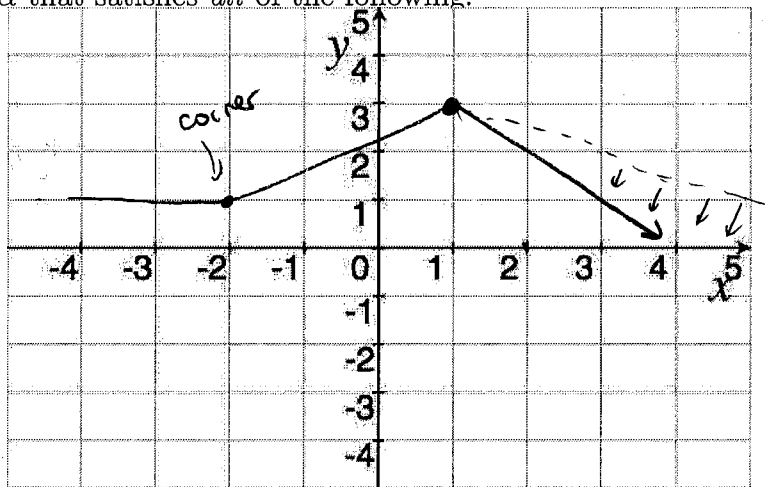
Key

This is a two-stage quiz. During the first stage, use your knowledge & calculator to take this quiz. You have 15 min. In the second stage, you are now welcome to use your books, notes, and students in the class to retake the same quiz. You have 15 min. to write one solution (with everyone's name on it!!!) to be turned in for the group.

Show *all* your work. Reasonable supporting work must be shown for any partial credit.

1. [4] Sketch the graph of a function α that satisfies *all* of the following.

- (a) $\alpha(1) = 3$ (+5)
- (b) α is continuous on $(-3, 3)$ (+1)
- (c) $\alpha'(-2)$ does not exist. (+1)
- (d) $\alpha'(x) < -\frac{1}{2}$ when $1 < x < 3$ (+1)



W/TAH
§ 4.8 # 40

2. [1] Consider α described above. What is the largest value $\alpha(3)$ could be?

the graph must stay below the dotted line

OR $\alpha(3) - \alpha(1) = \int_1^3 f'(c) dc$ for $1 \leq c \leq 3$

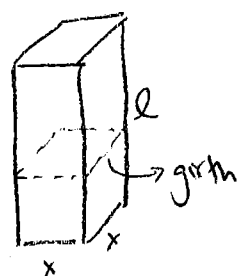
$$\frac{\alpha(3) - 3}{2} < -\frac{1}{2} \Rightarrow \alpha(3) - 3 < -1 \Rightarrow \alpha(3) < 2$$

3. Suppose a package to be mailed using a certain postal service may not measure more than 114 inches in length plus girth. (Length is the longest dimension and girth is the largest distance around the package, perpendicular to the length.) For this problem, assume the base of your rectangular box is a square.

- (a) [3] Find a function that describes volume as a function of only one variable.

Volume = $x \cdot x \cdot l$ (+5)
(use: two variables)

114 = length + girth
114 = $l + x + x + x + x$ (+1)
114 = $l + 4x$
 $\Rightarrow l = 114 - 4x$



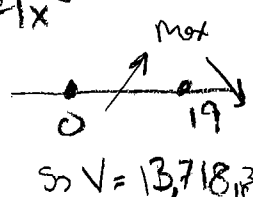
Volume = $x \cdot x \cdot (114 - 4/x)$

- (b) [2] Find the greatest volume (in inches cubed) that may be mailed.

look for extreme (+5)
notation (+5)
verify max (+5)
got it (+5) (x or y)

We need to maximize
Desmos: (19, 13718)
max Vol

Method B
 $V(x) = 114x^2 - 4x^3$
 $V'(x) = 228x - 12x^2$
 $V'(x) = 12x(19 - x)$
when $x=0$ and $x=19$



Adams MVT #1
reason (+1)

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start (+5)
picture/notation (+1)