

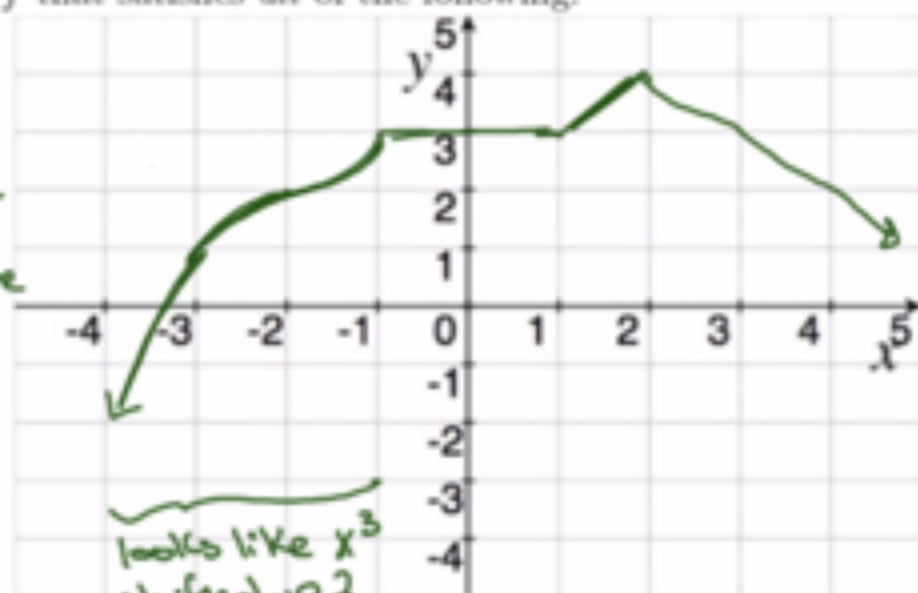
TMATH 124: Quiz 8

Key

Reasonable supporting work must be shown to earn credit.

1. [5] Sketch the graph of a function f that satisfies all of the following.

- 1.5 (a) f is continuous on $[-3, 4]$ *don't pick up pencil*
- 1 (b) $x = 2$ is a maximum
- 1 (c) $f'(2)$ does not exist *corner*
- 1 (d) $f'(-2) = 0$ *horiz. tangent line*
- 1 (e) $x = -2$ is *not* a maximum or minimum



looks like x^3
shifted up 2
left 2

for fun $f(x) \rightarrow \begin{cases} (x+2)^3 + 2 & \text{if } x \leq -1 \\ 3 & \text{if } -1 < x \leq 1 \\ x + 2 & \text{if } 1 < x \leq 2 \\ -x + 6 & \text{if } 2 < x \end{cases}$

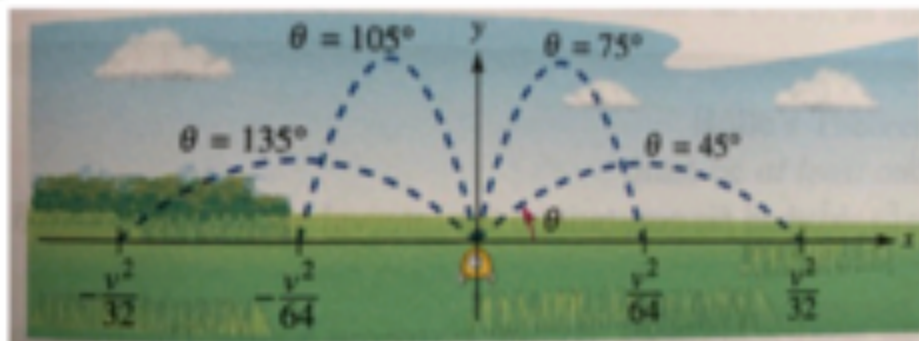
Concept Check
15 #1
worth #2

There are LOTS
of answers here!



2. A sprinkler is constructed in such a way that $\frac{dx}{d\theta}$ is constant, where θ ranges between 45° to 135° . The distance the water travels horizontally is $x = \frac{v^2 \sin(2\theta)}{32}$ where v is the speed of the water that is held constant.

(a) [1] Describe what $\frac{dx}{d\theta}$ is, consider providing the units in the explanation.



$\frac{dx}{d\theta}$ is the rate that θ is moving (with respect to time). Its units are degrees/second

(b) [1] What part of the lawn receives the least amount of water?

Perhaps find where $|dx/d\theta|$ (velocity of x) is maximal?
 Since water would be spread out over a greater surface area
 note the absolute value because it is really speed we care about
 So maximizing $|dx/d\theta|$
 $\frac{dx}{d\theta} = \frac{v^2}{32} \frac{d}{d\theta} \cos(2\theta)$ let $\frac{dy}{dt} = 0$

(c) [3] Explain & justify your answer above analytically.

- 1) Find Critical Points
- a) take derivative
- b) find zeros of der.
- c) find the domain \rightarrow endpoints?

$(\frac{dx}{d\theta})' = \frac{v^2}{16} (\frac{d\theta}{dt})^2 \sin(2\theta)$
 $0 = \frac{v^2}{16} (\frac{d\theta}{dt})^2 \sin(2\theta)$
 +1 $\frac{v^2}{16} (\frac{d\theta}{dt})^2 \sin(2\theta)$
 vert. stretch

$\theta = 45^\circ, 90^\circ, 135^\circ$
 in $[45^\circ, 135^\circ]$
 So 90° But this area is covered twice as often \rightarrow
 Evaluate each critical point
 45° 90° 135°
 \rightarrow max

Concept check The
 Writing Day 15 #2
 541 #70 542 #04
 Ophoni #3 543 #03
 541 #71, 542 #04

This question
 is hard for
 I meant to
 say?

+1 intended answer 90° but others accepted