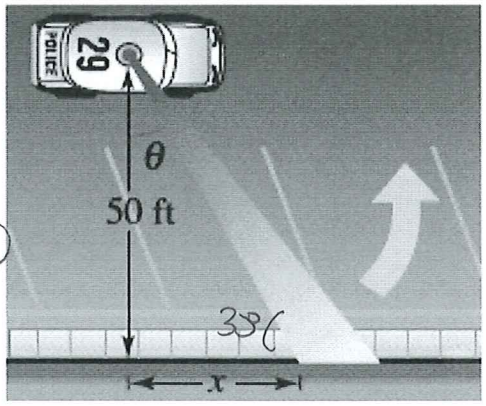
42
+15
57

Key

TMATH 124 Quiz 4

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. Supporting work is needed to earn credit. There are two sides of this quiz.

1. (WebHW11 #9) A patrol car is parked 50 feet from a building shown to the right. The revolving light on top of the car turns at a rate of 8 revolutions per minute.



(a) [1] Find θ as a function of x.

SOHCAHTOA $\Rightarrow \tan\theta = \frac{x}{50}$ (+.5)

$\Rightarrow \theta = \arctan\left(\frac{x}{50}\right)$ (+.5)

(b) [3] Find how fast the light beam is moving along the wall when the beam makes and angle of 30° with the building wall.

want $\left.\frac{dx}{dt}\right|_{\theta=90-30}$ = $\left.\frac{dx}{dt}\right|_{\theta=60°}$ (+.5)

know $\frac{d\theta}{dt}$ = 8 rev/min (+.5) $= 8 \cdot 2\pi \frac{\text{rad}}{\text{min}} = 16\pi$ rad/min

$\theta = \arctan\left(\frac{x}{50}\right)$ OR $\tan\theta = \frac{x}{50}$

$\frac{d}{dt}$ ($\frac{d}{dt}$)

implicit diff (+.5)
derivative (+1)

$\frac{d\theta}{dt} = \frac{1}{1+\left(\frac{x}{50}\right)^2} \cdot \frac{1}{50} \cdot \frac{dx}{dt}$

$(\sec^2\theta)\frac{d\theta}{dt} = \frac{1}{50}\frac{dx}{dt}$

$\Rightarrow \frac{dx}{dt} = \left(\frac{d\theta}{dt}\right) \cdot 50\left(1+\left(\frac{x}{50}\right)^2\right)$

so $\left.\frac{dx}{dt}\right|_{\theta=60°} = 50(\sec^2 60°) \cdot 16\pi$

plug in #'s (+.5)

$= 16\pi \cdot 50\left(1+\left(\frac{50\tan 60°}{50}\right)^2\right)$

$= 800\pi(1+(\sqrt{3})^2)$

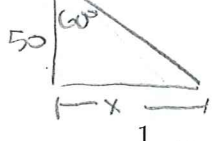
$= 800\pi \cdot 4$

$= 3200\pi$ ft/min

$= 50(2^2) \cdot 16\pi$

$= 3200\pi$ ft/min

$\approx$ 10053 ft/sec



$\tan 60° = \frac{x}{50}$

$\Rightarrow x = 50\tan 60°$

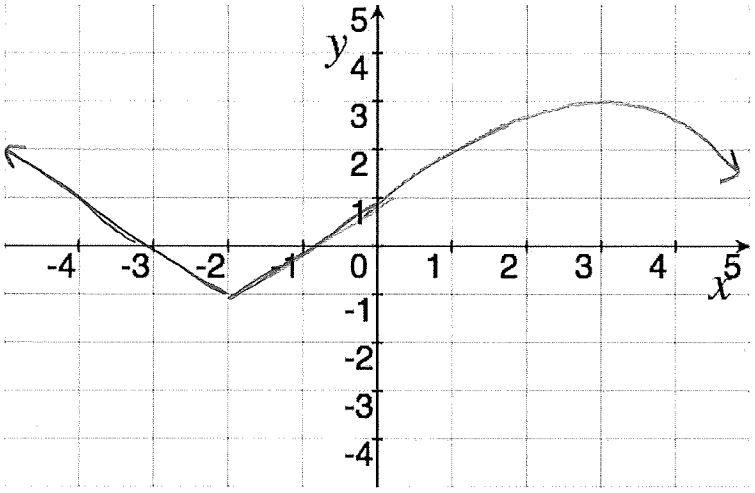
2. [3] (ExtremeActivity #1) Draw the graph of a function f that satisfies all of the listed criteria:

(a) f is continuous on $(-3, 3)$ ✓

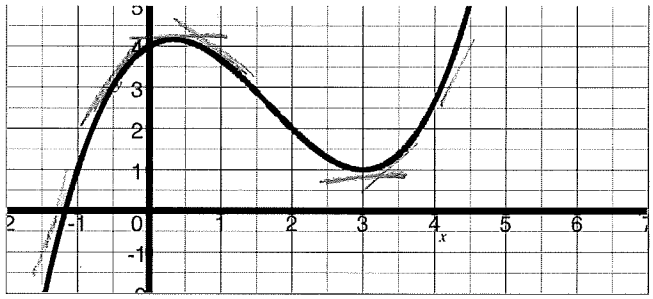
(b) the only critical points of f are at $x = -2$ and 3 ✓

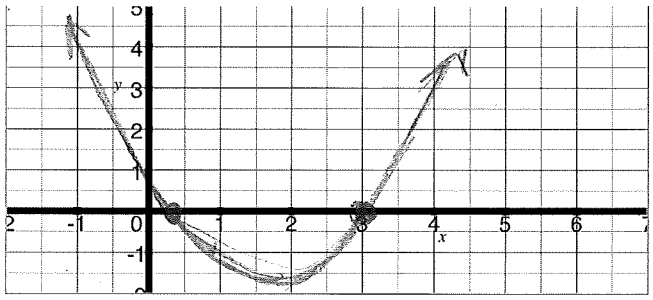
(c) $f'(-2)$ is not defined ✓

(d) f has a relative minimum at $x = -2$ ✓



3. [3] (§4.3 #78) The graph of g is shown to the right. Sketch a graph of the derivative of g on the axes below.





zeros

negative slope

positive slope