Unit 10 Group Work
PCHA 2022-23 / Dr. Kessner

No calculator! Have fun!

1. Graph the given function on the specified interval. Find all critical points. Identify any points where there is a local min/max, and verify with a derivative test. Identify the absolute max and min. If either fails to exist, state the condition of the Extreme Value Theorem that is *not* satisfied.

a. $g(x) = x^2 - 9$ on $[-3, 3]$

b. $h(x) = \ln x$ on $(0, 2]$

c. $m(x) = \tan x$ on $[0, \pi]$

d. $n(x) = \sin x$ on $(0, \pi)$

2. For each of the given functions find all antiderivatives.

a. $p'(x) = x^4$

b. $q'(x) = \cos 2x$

c. $r'(x) = \dfrac{1}{x}$

d. $s'(x) = \dfrac{1}{x^2}$

e. $t'(x) = e^{\frac{x}{3}}$

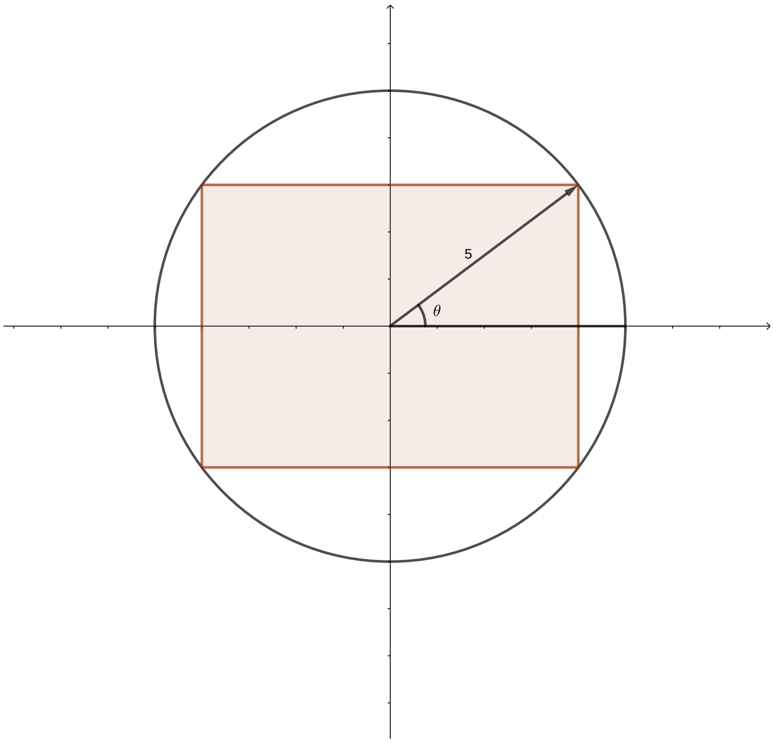
3. For each of the following functions: sketch the graph, then find all local extrema and verify with a derivative test.

a. $f(x) = (x + 3)^4$.

b. $g(x) = x^3 - 9x$.

c. $h(x) = 3 + 3 \sin 2x$. You may restrict your attention to the first period of the function. But as an extra challenge, identify *all* local extrema (not just the first period), including derivative tests to show which are minima and which are maxima.

4. Consider the following rectangle inscribed in a circle of radius 5. Note that the perimeter of the rectangle changes as the angle θ changes.



a. Write an equation for the perimeter $P(\theta)$ of the rectangle as a function of θ. Challenge: draw a sketch of the graph of $P(\theta)$ on $[0, \frac{\pi}{2}]$ by hand, and then check with graphing software.

b. Find the absolute min and max of the perimeter, for θ in $[0, \frac{\pi}{2}]$. Why must there be an absolute minimum and maximum?