Unit 10 Test
PCHA 2020-21 / Dr. Kessner

Name/Pledge:

No notes! 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. $f(x) = (x+1)(x-2)^2$ on $[-2, 3]$

b. $g(x) = \cos x$ on $(\frac{\pi}{2}, \pi)$

c. $h(x) = \tan(x)$ on $[-\frac{\pi}{4}, \frac{\pi}{2}]$

d. $j(x) = 2^{-|x|}$ on $[-3, 3]$

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

a. $k'(x) = -\cos 5x$

b. $l'(x) = 7x^3 + x^2$

c. $m'(x) = x^{-3} + x^{-1} + x^1$

d. $n'(x) = 7^x + x^7$

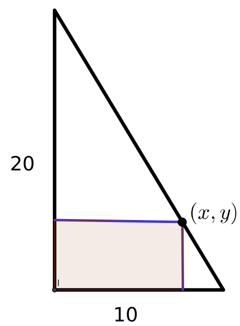
e. $p'(x) = e^{5x+1}$

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

a. $q(x) = x^4 - 8x^2 + 16$ *(Hint: factor as a perfect square)*

b. $r(x) = -3 \sin \pi x$

4.



You are installing a rectangular robot playing field in a triangular room, and you want to maximize the area of the playing field.

a. Write your constraint on x and y (the equation of the diagonal line).

b. Write an equation for the function you want to maximize (the area of the rectangle). Use your constraint to eliminate one of the variables.

c. Maximize your function by taking the derivative and finding any critical points. Be sure to use a derivative test to verify that you have found a local max. *Bonus: How do we know that this is actually an absolute maximum?*