

Math 150: Quiz 2

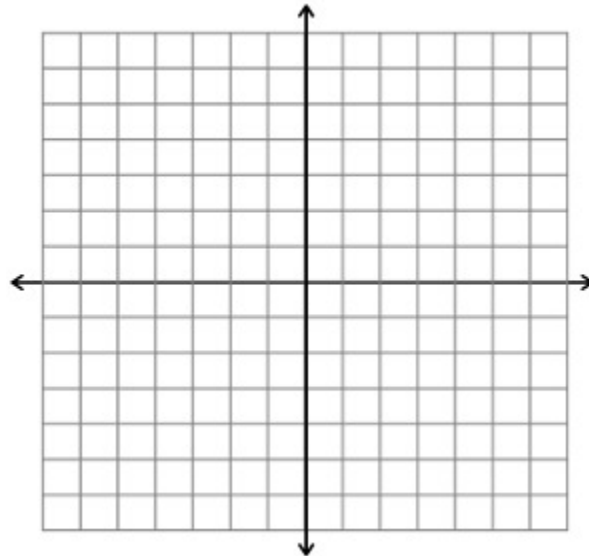
Name: _____

Instructions: You must show your work on all problems except problem 2. If you write only the answer, you will get zero credit for that problem.

1. (10 points) The radius of a circle increases at a constant rate of 10 m/s. How fast is the area of the circle increasing when the radius is 200 m? (Note: the area of a circle of radius r is πr^2 .)

2. (10 points) Sketch a graph of a single continuous function f such that

- f has domain $[-3, 3]$
- $f(-1) = -2$
- f has an absolute maximum at $x = 3$
- f has an absolute minimum at $x = -1$
- f has local minimums at $x = -1$ and $x = 1$
- f is *not* differentiable at $x = 1$
- f has a local maximum at $x = 0$



3. (10 points) Find the absolute maximum and absolute minimum values of $f(x) = (x^2 - 1)^3$ on the interval $[-1, 2]$.

4. (10 points) Let $f(x) = 5x^3 - 3x^5$. Find the intervals on which f is increasing or decreasing and the intervals where f is concave up or concave down. Find the local maximum and local minimum values of f and the inflection points.

5. (10 points) You are designing a cylindrical paper drinking cup with a capacity of 10 cm^3 . Find the height and radius of the cup that will use the least amount of paper. *Be sure to check that the local minimum you find is in fact the absolute minimum (hint: consider the concavity).* (Note: the volume of a cylinder is $\pi r^2 h$ and the surface area of a cylinder including the base but not the top is $2\pi r h + \pi r^2$.)