

Math Camp  
**Homework 5**

- (1) Find the (global) maximum and minimum of each function on the given interval, if it exists:
- (a)  $f(x) = x^3 + x + 1$  on  $[-1, 2]$
  - (b)  $f(x) = x^2 - 8x + 15$  on  $[1, 6]$
  - (c)  $f(x) = \frac{2x}{x^2 + 1}$  on  $[0, 3]$
  - (d)  $f(x) = 3x^{2/3} + 2x$  on  $[-1, 1]$  (Hint: be sure to check where  $f'(x)$  is undefined)
  - (e)  $f(x) = x \ln(x)$  on  $(0, \infty)$ . (f)  $f(x) = e^x - e^{2x}$  on  $(-\infty, \infty)$ .
- (2) Find all local maximum and minimum values of  $f(x) = x^4 - 2x^2$ , and the  $x$ -coordinates where they occur. Does  $f(x)$  have a global maximum or minimum on  $\mathbb{R}$ ?
- (3) Of all the tangent lines to the graph of  $y = \frac{1}{x^2 + 3}$ , which are the lines with the largest and smallest slope?
- (4) Find the point on the graph of  $y = \sqrt{x}$  that is closest to the point  $(4, 0)$ .
- (5) What is the rectangle of largest area that can be formed with one edge aligned with the  $x$  axis and upper two corners lying on the graph of the circle  $x^2 + y^2 = 4$ ?