

Math Camp  
**Homework 4**

(1) Compute the derivative of each function.

(a)  $f(x) = 3x^5 + 4x^3 - 7x^2 - 3$

(b)  $f(x) = x^5 + 5^x + 5x + 5$

(c)  $f(x) = \sqrt[3]{e^x + x}$

(d)  $f(x) = \frac{x^3+1}{x^3-1}$

(e)  $f(x) = \ln(x^4 + 1)\sqrt{x^4 - 1}$

(f)  $f(x) = x^3 e^{4x^2}$

(g)  $f(x) = \sin(\sqrt{x^2 + 4})$

(h)  $f(x) = x \cos(x^5 e^x)$

(2) Find the tangent line to the graph of  $y = \frac{1}{x^2 + 1}$  at the point where  $x = -1$ .

(3) Find the tangent line to the circle  $x^2 + y^2 = 25$  at the point  $(3, 4)$ . It may be helpful to use the fact that the upper half of the circle is given by the equation  $y = \sqrt{25 - x^2}$ .

(4) For each of the following functions, find all intervals where  $f$  is increasing and decreasing, all intervals where  $f$  is convex (concave upward) and concave (concave downward), and all values of  $x$  where the  $f$  attains a local maximum or local minimum.

(a)  $f(x) = x^3 - 12x$

(b)  $f(x) = x + \frac{1}{x}$

(c)  $f(x) = x e^{2x}$