Math 151
In-class Worksheet

1. Find the following derivatives.

   (a) $f(x) = \frac{x^3+4x^2-x-17}{x^2+1}$; $f'(x)$

   (b) $y = \sin(x^3) + \cos(3^\pi)$; $\frac{dy}{dx}$

   (c) $y = x^6 - 4x^5 + x^2 - 17x + 106$; $\frac{d^2y}{dx^2}$

   (d) $g(x) = \tan x$; $g''(x)$

   (e) $h(t) = t^2\sqrt[3]{(t^3+17)^4}$; $h'(t)$

2. Here is a table of values for a couple of functions and their derivatives.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-2	1	4	5	-4
0	2	-2	3	7
2	4	8	1	9
3	2	-7	-4	4
4	1	-1	-2	8

   For $h(x) = g(f(x))$, $j(x) = \frac{f(x)}{g(x)}$, and $k(x) = f(x^2)$, compute:

   (a) $h'(0)$

   (b) $j'(3)$

   (c) $k'(2)$

3. Find the tangent line to the curve

$$x^3y^2 + x^2 - y = 3$$

   at the point $(1, 2)$.

4. Find the maximum and minimum values of the given functions.

   (a) $f(x) = x^3 - 12x + 7$ on the interval $[-3, 3]$

   (b) $g(x) = \sqrt[3]{(x-4)^2}$ on the interval $[3, 12]$

5. Let $f(x) = 2 - \frac{6}{x} + \frac{6}{x^2} = \frac{2x^2-6x+6}{x^2}$.

   (a) Find all the asymptotes of the graph $y = f(x)$.

   (b) Find the intervals on which f is increasing and on which f is decreasing.

   (c) Find the intervals on which f is concave up and on which f is concave down.

   (d) Sketch the graph $y = f(x)$. Be sure to label all asymptotes, local maxima, local minima, and inflection points. You may use the grid provided below.

   Be sure to label your axes with numbers!

Hint. For some parts, it is easier to add up separate fractions, as in the first formula; for others, it is easier to bring everything over a common denominator, as in the second formula.