

## Mathematics Review - Math 419

1. Find all the roots of:  $2x^3 - 23x^2 + 59x - 24 = 0$

2. Sketch the following functions:

(a)  $y = 2x - 7x^2$

(b)  $y = \frac{10x^4}{2^4 + x^4}$

(c)  $f(x) = \begin{cases} 2x, & 0 \leq x \leq 0.5 \\ 2 - 2x, & 0.5 \leq x \leq 1.0 \end{cases}$

3. Compute  $dy/dx$ :

(a)  $y = 2x - 7x^2$

(b)  $y = xe^{-x^2}$

(c)  $x^2 + y^2 = 10$

4. Consider  $f(x) = cx^2(2 - x)$  where  $c > 0$ .

(a) Locate the maxima, minima and inflection points.

(b) On what intervals is  $f(x)$  increasing or decreasing?

(c) For all  $r$  such that  $f(r) = 0$ , compute  $f'(r)$

5. Consider the two curves  $y = x$  and  $y = \lambda x(1 - x)$ . There is always a point of intersection at  $x = y = 0$ . For what values of  $\lambda$  is there a second point of intersection in the intervals:

(a)  $x < 0$ , (b)  $0 < x < 0.5$ , and (c)  $0.5 < x < 1$ .