

## Math 220 - Practice Exam 1 (version A)

1. Give the limit if it exists

(a)  $\lim_{x \rightarrow 2^-} \frac{|x^2 - 2x|}{x - 2}$

(b)  $\lim_{x \rightarrow 2^+} \frac{|x^2 - 2x|}{x - 2}$

(c)  $\lim_{x \rightarrow 2} \frac{\sqrt{x+2} - 2}{x - 2}$

2. Determine the derivatives of the following functions:

(a)  $f(x) = x^4 - 2\sqrt{x} + 1 - \frac{2}{x^3} + \pi x^\pi$ ,

(b)  $f(x) = (x^2 - 4x + 5)^6 (2x^3 - 1)^3$ ,

(c)  $g(x) = \frac{3}{(x - \sin(x))^2}$ ,

(d)  $f(x) = \frac{\sin(x) \tan(3x)}{1 + \cos^2(x)}$ ,

(e)  $h(x) = \sin^3(x^3)$ .

3. Evaluate the limit

$$\lim_{h \rightarrow 0} \frac{\tan(\pi/4 + h) - 1}{h}.$$

4. If  $f(x) = x^3 - 2x + 1$ ,

(a) What is the differential of  $f(x)$  at  $x = 2$ ?

(b)  $f(2) = 5$ . Use the differential to approximate  $f(1.9)$ .

5. Use implicit differentiation to determine the equation of the tangent line to the curve

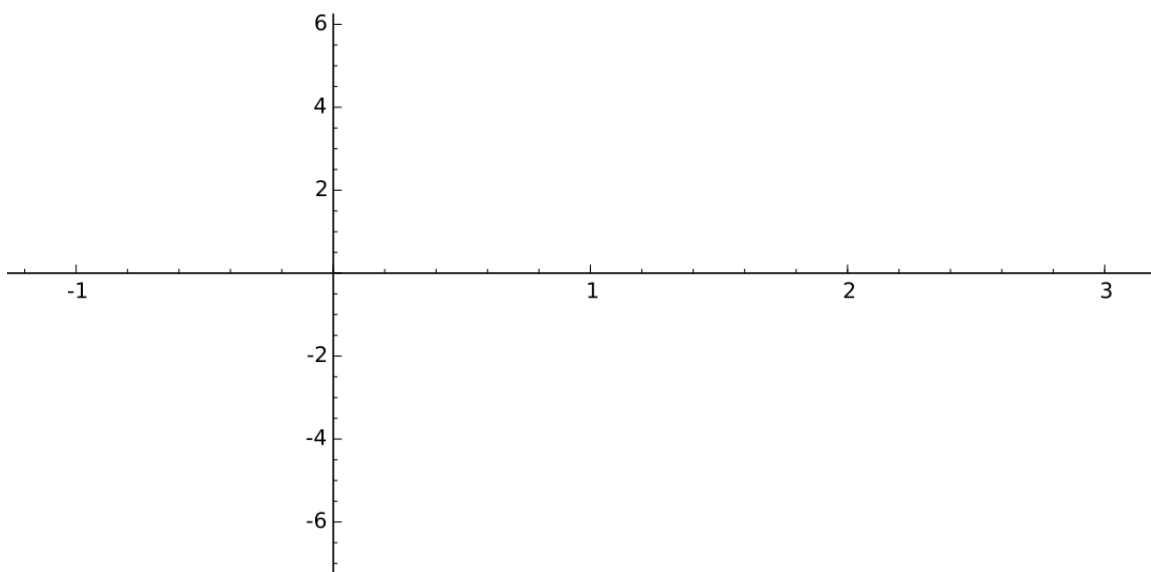
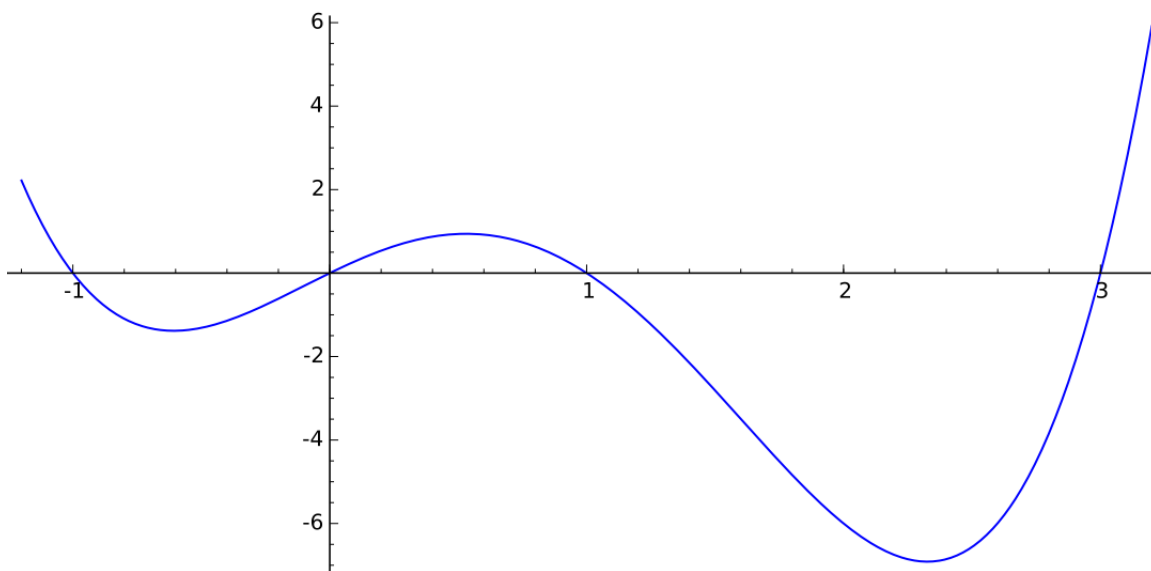
$$x^3 y^2 - x^2 y^3 + 2x^2 - y^2 = 1$$

at the point  $(1, 1)$ .

6. A 10m ladder leans against a wall. As the base of the ladder is pulled away at a rate of 0.6m/s, the ladder slides down the wall. At what rate is the height of the top of the ladder changing when the base of the ladder is 6m from the wall? (Give an exact numerical answer)

7. Determine where the function  $f(x) = x\sqrt{8 - x^2}$  has a horizontal tangent line.

8. Sketch the graph of the derivative of the given function  $f(x)$ :



9. The chart below gives the values of  $f(x)$  and  $g(x)$  and their derivatives at  $x = 2$ ,  $x = 3$  and  $x = 4$ .

	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	4	-2	3	9
3	0	29	-1	4
4	3	2	7	11

Use it to find the following derivatives,

- (a) If  $h(x) = f(g(x))$ , determine  $h'(4)$ .
- (b) If  $k(x) = g(f(x))$ , determine  $k'(4)$ .