

Exam 2

No calculators. Show your work. Clearly mark each answer.

1. (10 points) Find the following limits:

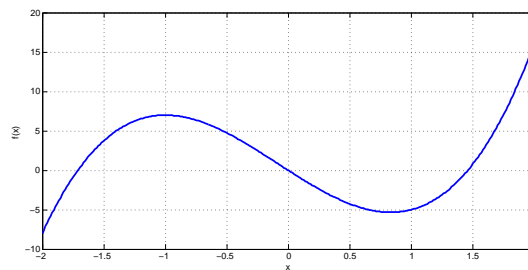
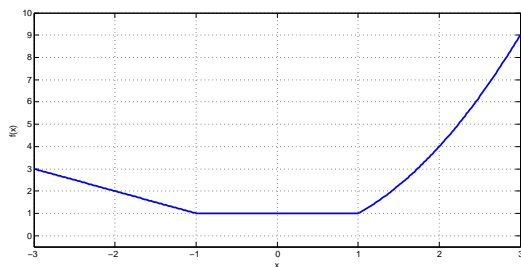
(a)

$$\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3}$$

(b)

$$\lim_{x \rightarrow \infty} \frac{x + 1}{x^2}$$

2. (20 points) Sketch derivatives of the following functions:



3. (20 points) Differentiate the following functions

(a)

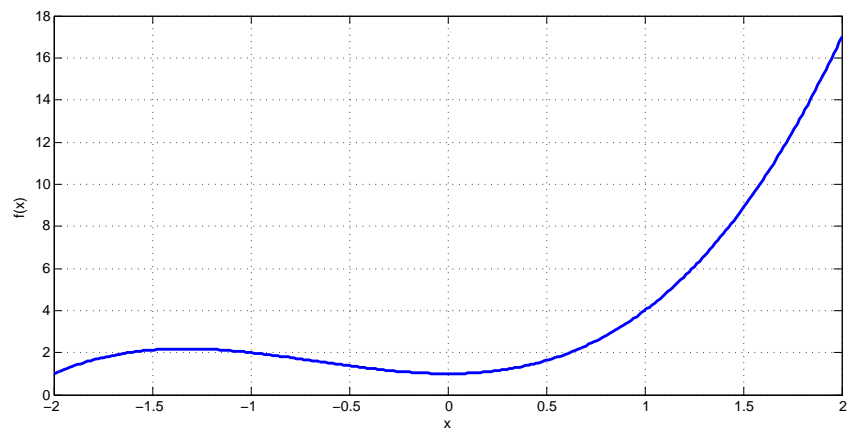
$$f(x) = x^3 + 2x^2 - \frac{1}{x} - \sqrt[3]{x} + 5$$

(b)

$$f(x) = (x^2 + 2)(\sqrt{x} - 1)$$

4. (10 points) For which value of a is the following function continuous?

$$f(x) = \begin{cases} x^2 + a, & x > 0 \\ 5x - 3, & x \leq 0. \end{cases}$$



5. (10 points) Estimate the slopes of the function on the graph above at points $x = -1$ and $x = 1$.
6. (10 points) Find the equation of the tangent line of $f(x) = 1/\sqrt{x}$ at $x = 4$.
7. (20 points) The distance of a particle from some fixed point is given by $s(t) = t^2 + 3t + 2$.
 - (a) Find the average velocity of the particle over $[1, 2]$.
 - (b) Find the instantaneous velocity after 1 second.