MATH 19 Problem Set 1

Assigned 2/2 ; Due 2/8 in class

For full credit you must show your work. Partial credit may be given for incorrect solutions if sufficient work is shown. Please organize your work. I will not award credit if I cannot see your thought process.

2.2 Infinite Limits and Limits at Infinity

1. Draw a graph that satisfies both of the limit expressions below

$$\text{(a) } \lim_{x\to 1^+} f(x) = -\infty \quad ; \quad \text{(b) } \lim_{x\to\infty} f(x) = -1$$

2. Determine the following limits. Use $+\infty$ or $-\infty$ where appropriate.

   (a)
   $$\lim_{x\to -2^-} \frac{x^2+4x+4}{x+2}$$

   (b)
   $$\lim_{x\to 3^-} \frac{3x+3}{x-3}$$

   (c)
   $$\lim_{x\to 1^+} \frac{x^3+1}{x^2+1}$$

   (d)
   $$\lim_{x\to 4^+} \frac{2x^2}{x-4}$$

   (e)
   $$\lim_{x\to -3^-} \frac{x^2+3x+1}{(x+3)^3}$$

3. Determine the following limits. Use $+\infty$ or $-\infty$ where appropriate.

   (a)
   $$\lim_{x\to -\infty} \frac{x^2}{10x^3+55}$$

   (b)
   $$\lim_{x\to \infty} \frac{-3x^4+1}{x^2-10}$$

   (c)
   $$\lim_{x\to \infty} \frac{9x-4}{x-5}$$

4. Find the vertical AND horizontal asymptotes of the following functions

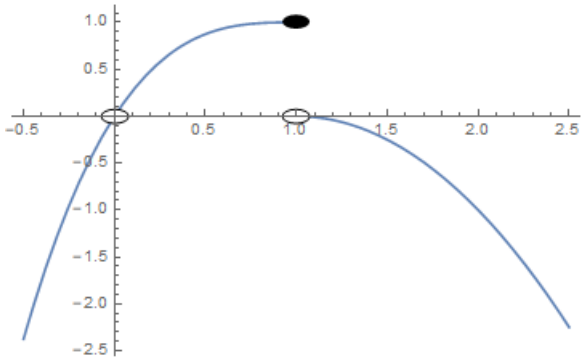
   (a)
   $$\frac{x^3+x}{x^2-4}$$

   (b)
   $$\frac{x^2}{x^2+9}$$

   (c)
   $$\frac{x+3}{x^2+x-6}$$

2.3 Continuity

1. Explain why the function below is not continuous at $x=0$ and $x=1$.



2. List the intervals where the following functions are continuous.

   (a) x^4-x^2-2 ; (b) $(2x+5)^{1/3}$; (c) $\dfrac{x}{x^2+1}$

3. Determine the sign charts for the following functions.

   (a)
   $$\frac{x^2-4}{x+2}$$

   (b)
   $$\frac{(x-1)(x-2)(x-3)}{x^2+2}$$

4. Use your sign charts to solve the inequalities.

   (a)
   $$\frac{x^2-4}{x+2}<0$$

   (b)
   $$\frac{(x-1)(x-2)(x-3)}{x^2+2}>0$$

2.4 The Derivative

1. Compute the average rate of change.

   (a)
   $$\sqrt{x+7} \quad \text{on} \quad [0,1]$$

   (b)
   $$x^4 + 3x \quad \text{on} \quad [1,2]$$

2. Find $f'(x)$.

   (a)
   $$2x^2 + x + 3$$

   (b)
   $$5 + 2\sqrt{x}$$

   (c)
   $$\frac{2x}{x-1}$$

3. Find the equation of the tangent line of:

   (a)
   $$5 + 2\sqrt{x} \quad \text{at} \quad x = 10$$

   (b)
   $$\frac{2x}{x-1} \quad \text{at} \quad x = 10$$