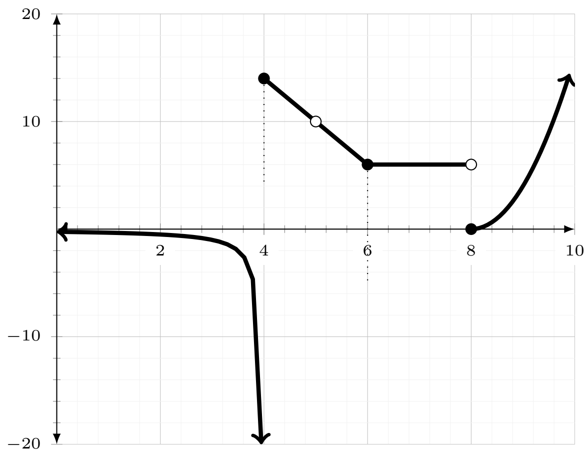
Lecture Notes: Chapters 1 & 2 Review

Practice Problems:

1. Use the graph of $f(x)$ below to answer the following questions.



(a) Assuming the arrows on the graph indicate a continued curve in that direction, make an educated guess at the domain of the function $f(x)$.

(b) Find all x-values in the domain of $f(x)$ for which $f(x)$

i. fails to be continuous.

ii. fails to be differentiable.

(c) Evaluate the following limits or explain why they do not exist.

(i) $\lim_{x \to 4^-} f(x) =$

(ii) $\lim_{x \to 4^+} f(x) =$

(iii) $\lim_{x \to 4} f(x) =$

(iv) $\lim_{x \to 5} f(x) =$

(v) $\lim_{x \to 6} f(x) =$

(vi) $\lim_{x \to 7} f(x) =$

(vi) $\lim_{x \to 8} f(x) =$

(vii) $\lim_{x \to 8^-} f(x) =$

2. Find the horizontal and vertical asymptotes (if any) of the graph of $f(x) = \frac{2x^2}{3x^2+2x-1}$ and show your answers are correct.

3. Evaluate the following limits. Show your work. *Make sure you are writing your mathematics correctly and clearly.*

(a) $\lim_{t \to 2} \left(\dfrac{t^2 - 4}{t^3 - 3t + 5} \right)^3 =$

(b) $\lim_{x \to 4^-} \dfrac{x^2 + 3x}{x^2 - x - 12} =$

(c) $\lim_{x \to -3} \dfrac{x^2 - 4x}{x^2 - x - 12} =$

(d) $\lim_{h \to 0} \dfrac{(h-5)^2 - 25}{h} =$

4. For each function below, determine all the values in the domain of the function for which the function is continuous.

(a) $f(x) = \begin{cases} \frac{3}{x+5} & x < 1 \\ \frac{x+1}{2} & 1 \leq x \leq 3 \\ x^2 - 7 & 3 < x \end{cases}$

(b) $g(x) = \frac{2^x+1}{\sqrt{1-x}}$

5. Find the limit or show that it does not exist.

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

(b) $\lim_{x \to \infty} [\ln(1+x^2) - \ln(1+x)] =$

(c) $\lim_{x \to \infty} \frac{3x^2+2x}{\sqrt{x^4+2x}}$

6. The displacement (in feet) of a particle moving in a straight line is given by $s(t) = 9t - t^2$ where t is measured in seconds.

   (a) Find the average velocity from $t = 1$ to $t = 3$ and include units with your answer.

   (b) Find the instantaneous velocity of the particle when $t = 1$ and include units with your answer.