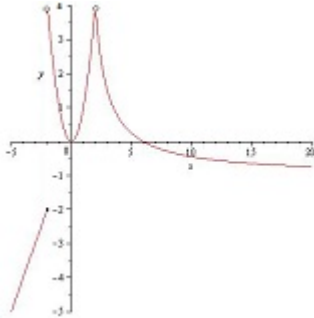


MATH 1520 Assignment 2

Attempt all questions and show all your work. The assignment is due Friday October 18th AT THE BEGINNING OF CLASS.

- At the start of an experiment there are 10000 bacteria. The population is increasing exponentially. After 2 hours, there are 12000 bacteria. How long will it take for the population to grow to 17000?
- For the following function, find the following limits if they exist. If they don't, explain why not.



$$(a) \lim_{x \rightarrow -2^-} f(x) \quad (b) \lim_{x \rightarrow -2^+} f(x) \quad (c) \lim_{x \rightarrow -2} f(x) \quad (d) \lim_{x \rightarrow 0} f(x)$$

$$(e) \lim_{x \rightarrow 2^-} f(x) \quad (f) \lim_{x \rightarrow 2^+} f(x) \quad (g) \lim_{x \rightarrow 2} f(x) \quad (h) \lim_{x \rightarrow \infty} f(x)$$

- Evaluate the following limits if they exist. If they don't exist, give a reason why not, and determine whether the limit goes to ∞ , $-\infty$ or neither.

$$(a) \lim_{x \rightarrow 2} \frac{2x^2 + 3}{-x^2 - 6x + 4}$$

$$(b) \lim_{y \rightarrow -1} \frac{2y^3 - y + 1}{y^2 - 2y - 3}$$

$$(c) \lim_{h \rightarrow 0} \frac{h^2 + h}{\sqrt{4+h} - \sqrt{4-h}}$$

$$(d) \lim_{t \rightarrow 3^-} \left(\frac{1}{t-3} - \frac{3}{t^2 - 2t - 3} \right)$$

$$(e) \lim_{x \rightarrow \infty} \left(\frac{3x^2 - x}{4 - 5x^2} \right)$$

$$(f) \lim_{x \rightarrow -\infty} \left(\frac{\sqrt{4x^2 + 5}}{4 - 3x} \right) \quad (\text{Hint: use } \sqrt{x^2} = |x| = -x \text{ for } x < 0.)$$

4. What value(s) of the constant k which makes the following function continuous everywhere? (Show all the limits and steps to justify your answer)

$$f(x) = \begin{cases} k^2 - 4x & x < -2 \\ 2kx + 5 & x = -2 \\ k - 5x & x > -2 \end{cases}$$

5. Find all asymptotes (horizontal and vertical) of the function $\frac{2x^2 + 3x - 2}{x^2 - 4}$. Justify your answers by using limits.