

Quiz 5 will cover the following topics: all topics from Quiz 1, 2, 3, and 4, Exam 1, and limits (1.5, 1.6)

Review Problems

1. Find the domain of each of the following expressions.

a) $\log_5(-x^2 + 10x - 20)$ b) $\log_2(x^2 - 6x + 8)$

2. Find each of the following limits.

a) $\lim_{x \rightarrow -2} (x^3 - 5x + 1)$ b) $\lim_{x \rightarrow 2^-} \frac{x + 3}{x - 3}$ c) $\lim_{x \rightarrow 3^-} \frac{x + 3}{x - 3}$

3. Consider the function $f(x) = \frac{x^2 + 8x}{-x^2 - 6x + 16}$. Find each of the following limits.

a) $\lim_{x \rightarrow -\infty} f(x)$ c) $\lim_{x \rightarrow -8^-} f(x)$ f) $\lim_{x \rightarrow 0^-} f(x)$ i) $\lim_{x \rightarrow 2^-} f(x)$
b) $\lim_{x \rightarrow \infty} f(x)$ d) $\lim_{x \rightarrow -8^+} f(x)$ g) $\lim_{x \rightarrow 0^+} f(x)$ j) $\lim_{x \rightarrow 2^+} f(x)$
e) $\lim_{x \rightarrow -8} f(x)$ h) $\lim_{x \rightarrow 0} f(x)$ k) $\lim_{x \rightarrow 2} f(x)$

4. Based on the previous problem, graph $f(x) = \frac{x^2 + 8x}{-x^2 - 6x + 16}$

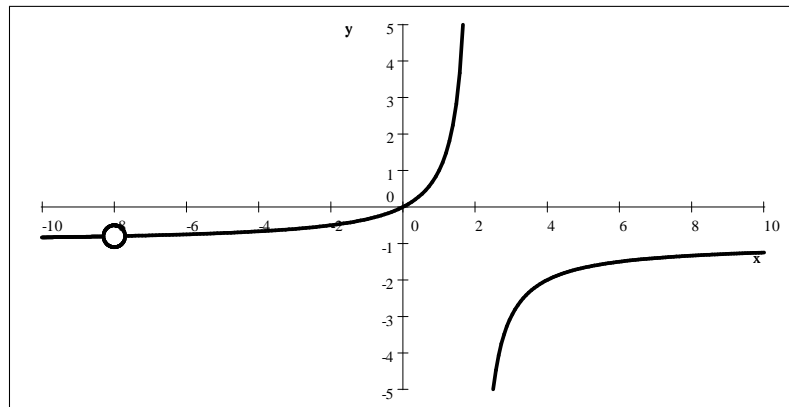
5. A company is introducing a new product. The marketing manager determines that t weeks after an advertising campaign begins, $P(t)$ percent of the potential market is aware of the burners, where

$$P(t) = 75 \frac{t^2 - 4t + 15}{t^2 - 4t + 45} + 11$$

- a) What percent of the potential market knows when the campaign begins?
b) What percent of the potential market knows about the product after 5 weeks?
c) What happens to the percentage $P(t)$ in the long run?

Review Problems - Answers

1. a) $5 - \sqrt{5} < x < 5 + \sqrt{5}$ b) $x < 2$ or $x > 4$
2. a) 3 b) -5 c) $-\infty$
3. a) -1 b) -1 c) $-\frac{4}{5}$ d) $-\frac{4}{5}$ e) $-\frac{4}{5}$ f) 0 g) 0 h) 0
 i) ∞ j) $-\infty$ k) undefined
4. $f(x) = \frac{x^2 + 8x}{-x^2 - 6x + 16} = \frac{x(x+8)}{-(x-2)(x+8)} = \begin{cases} -\frac{x}{x-2} & \text{if } x \neq -8 \\ \text{undefined} & \text{if } x = -8 \end{cases}$



5. a) 36% (We simply compute $P(0)$.) b) 41% c) 86%

Solution for c) Compute $\lim_{t \rightarrow \infty} P(t)$.

$$\lim_{t \rightarrow \infty} P(t) = \lim_{t \rightarrow \infty} \left(75 \frac{t^2 - 4t + 15}{t^2 - 4t + 45} + 11 \right) = \lim_{t \rightarrow \infty} \left(75 \frac{t^2 \left(1 - \frac{4}{t} + \frac{15}{t^2} \right)}{t^2 \left(1 - \frac{4}{t} + \frac{45}{t^2} \right)} + 11 \right) = 75 \cdot 1 + 11 = 86$$