

Quiz 3 will cover the following topics: all topics from Quiz 1 and 2 and Exam 1.

Review Problems

1. Find each of the following limits.

- | | | |
|--|--|---------------------------------------|
| a) $\lim_{x \rightarrow -\infty} (-7x^5 + x^3)$ | f) $\lim_{x \rightarrow -\infty} \log_2 x$ | k) $\lim_{x \rightarrow \infty} 2^x$ |
| b) $\lim_{x \rightarrow \infty} (-7x^5 + x^3)$ | g) $\lim_{x \rightarrow \infty} \frac{2x^2 + 3x + 1}{3x^2 - 5x + 2}$ | l) $\lim_{x \rightarrow -\infty} 2^x$ |
| c) $\lim_{x \rightarrow -\infty} (-7x^5 + x^6)$ | h) $\lim_{x \rightarrow \infty} \frac{11x^5 - 3x - 2}{2x - 24x^8}$ | |
| d) $\lim_{x \rightarrow \infty} (-7x^5 + x^6)$ | i) $\lim_{x \rightarrow \infty} \frac{2x^2 + 3x^4 + 1}{3x^2 - 5x^4 + 2}$ | |
| e) $\lim_{x \rightarrow -\infty} \frac{2x^2 - 8}{7x^2 - 5x + 2}$ | j) $\lim_{x \rightarrow \infty} \frac{-8x^7 + x + 5}{3x - 12}$ | |

2. 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) $\lim_{x \rightarrow 2} f(x)$ |

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

4. 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

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

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

Review Problems - Answers

1. See Section 1.5.

a) ∞ b) $-\infty$ c) ∞ d) ∞ e) $\frac{2}{7}$

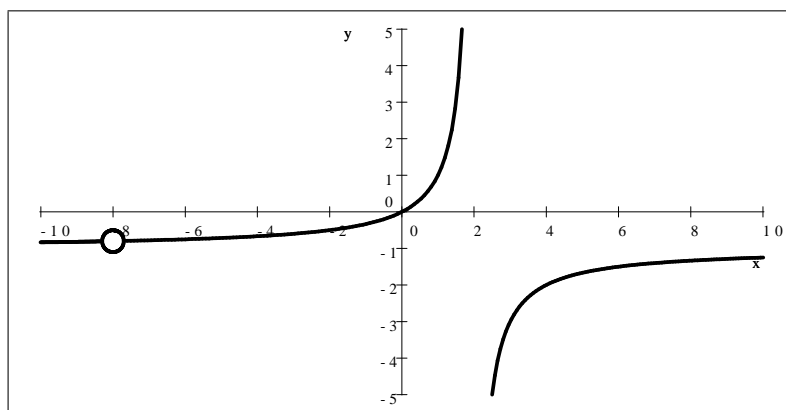
f) N/A, the function is not defined on negative numbers g) $\frac{2}{3}$ h) 0 i) $-\frac{3}{5}$

j) $-\infty$ k) ∞ l) 0

2. 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

$$3. f(x) = \frac{x^2 + 8x}{-x^2 - 6x + 16} = \frac{x(x+8)}{-(x-2)(x+8)} = \begin{cases} -\frac{x}{x-2} & \text{if } x \neq -8 \\ \text{undefined} & \text{if } x = -8 \end{cases}$$



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

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

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