

DUE Monday, November 10 at the beginning of class

1. Find the domain the following functions.

(a) $w(x) = -\ln(x - 2) + \frac{e^{x-7}}{x - 4}$

(b) $s(x) = \frac{x^2 - 3}{2 + \log_2(-x)}$

(c) $h(x) = \log_5(\sqrt{2x - 1}) - \sqrt[3]{x}$

(d) $z(x) = \frac{\ln(1 - 2x)}{\sqrt{9 - x^2}}$

2. Solve

(a) $\ln(x - 1) + \ln 6 = \ln(3x)$

(b) $e^{2x} - 3e^x = -2$

3. The general function $P(t) = P_0e^{kt}$ is used to model an insect population, where P_0 is the initial population ($P_0 \neq 0$) and t is time measured in hours. Suppose the insect population tripled after 17 hours. How long will it take the insect population to grow to nine times its initial size? Simplify your answer as much as possible.

4. Let $f(x) = \frac{x^2}{x - 4}$.

- (a) Determine where f is continuous.

- (b) Consider the limit $\lim_{x \rightarrow 4^+} \frac{x^2}{x - 4}$. Use the sequence $4 + \frac{1}{n}$ and the appropriate algebraic steps to evaluate this limit.

5. Use limits to determine the horizontal (or slant) asymptotes of the graphs of the following functions, if any.

(a) $f(x) = \frac{x^2 - 16}{3x^2 - 11x - 4}$

(b) $g(x) = \frac{3x^3 - 4x - 4}{2x^2 - 8}$

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

6. Determine the following limits and justify your answer. State what each limit tells you about the graph.

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

$$(b) \lim_{x \rightarrow 4} \frac{x^2 - 16}{3x^2 - 11x - 4}$$

7. For each rational function, determine the domain, end behavior, and intercepts. Then draw a rough sketch of the graph of the function, clearly labeling all intercepts and asymptotes on your graph.

$$(a) f(x) = \frac{x^2 - 16}{3x^2 - 11x - 4}$$

$$(b) g(x) = \frac{3x^3 - 4x - 4}{2x^2 - 8}$$

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

8. Sketch a graph of a rational function with all of the following limits and values. Only intercepts are $(-4, 0)$, $(0, -2)$, $(1, 0)$, $(5, 0)$ and

$$\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow -\infty} f(x) = -2$$

$$\lim_{x \rightarrow -1^-} f(x) = \infty \quad \lim_{x \rightarrow -1^+} f(x) = -\infty \quad \lim_{x \rightarrow 2} f(x) = \infty$$