

Homework 8: Due Friday April 7th in recitation.

Late Homework will not be accepted. **Write on only one side of each page. Staple all work.**

1. Let $P(x) = x^3 + 2x^2 - 8x$.

- (a) Find the zeros of P .
- (b) Find the x and y intercept(s) of P (if any).
- (c) Is $P(x)$ even, odd, or neither. Justify your answer.
- (d) Describe the end behavior of P . That is, evaluate the following limits $\lim_{x \rightarrow \infty} P(x)$ and $\lim_{x \rightarrow -\infty} P(x)$.

2. Let $f(x) = \frac{x^2 - x - 6}{x^2 + 3x}$.

- (a) Find the domain of f . Write your answer in interval notation.
- (b) Find the vertical asymptotes of $f(x)$. Describe the behavior at the asymptotes. Note that if you say $x = a$ is a vertical asymptote, then describing the behavior of f at $x = a$ requires you to evaluate the following limits $\lim_{x \rightarrow a^-} f(x)$ and $\lim_{x \rightarrow a^+} f(x)$.
- (c) Find, if any, the horizontal asymptotes of f . When asked to find the horizontal asymptotes of f , you must describe the end behavior of $f(x)$. That is, you must evaluate the following limits $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$.
- (d) Find the x and y intercept(s) if any.
- (e) Sketch the graph of $f(x)$. You will want to use the information in parts (a) -(d) to help you sketch the graph.

3. Let $f(x) = \frac{5x}{x^2 + 1}$.

- (a) Find the domain of f . Write your answer in interval notation.
- (b) Find the vertical asymptotes of $f(x)$. Describe the behavior at the asymptotes. Note that if you say $x = a$ is a vertical asymptote, then describing the behavior of f at $x = a$ requires you to evaluate the following limits $\lim_{x \rightarrow a^-} f(x)$ and $\lim_{x \rightarrow a^+} f(x)$.
- (c) Find, if any, the horizontal asymptotes of f . When asked to find the horizontal asymptotes of f , you must describe the end behavior of $f(x)$. That is, you must evaluate the following limits $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$.

- (d) Find the x and y intercept(s) if any.
- (e) Is the function even, odd, or neither.
- (f) Sketch the graph of $f(x)$. You will want to use the information in parts (a) -(d) to help you sketch the graph.
- (g) Suppose that $f(x)$ represents the concentration of a particular drug in your bloodstream at time x . Here, I am assuming that time $x \geq 0$. Does the drug ever leave your bloodstream? Explain.

4. Let $f(x) = \frac{x^3 - 2x^2 - 3x}{x - 3}$.

- (a) Find the domain of f . Write your answer in interval notation.
- (b) Find the vertical asymptotes of $f(x)$. Describe the behavior at the asymptotes. Note that if you say $x = a$ is a vertical asymptote, then describing the behavior of f at $x = a$ requires you to evaluate the following limits $\lim_{x \rightarrow a^-} f(x)$ and $\lim_{x \rightarrow a^+} f(x)$.
- (c) Find, if any, the horizontal asymptotes of f . When asked to find the horizontal asymptotes of f , you must describe the end behavior of $f(x)$. That is, you must evaluate the following limits $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$.
- (d) Find the x and y intercept(s) if any.
- (e) Sketch the graph of $f(x)$. You will want to use the information in parts (a) -(d) to help you sketch the graph.