1. For each of the following functions compute $\lim_{x\to+\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$:

(a) $f(x) = 3x^3 - x^2 + 2x - 7$

(b) $f(x) = \dfrac{2x+1}{3x^4-2}$

(c) $f(x) = \dfrac{40x^5 + x^2}{16x^4 - 2}$

(d) $f(x) = \dfrac{3x^7 - 4x^4 + 1}{2x^7 + 2x}$

(e) $f(x) = \dfrac{2x}{x^2+4}$

Which of the functions above have horizontal asymptotes and what are the asymptotes?

2. Find the following limits, provided they exist:

(a) $\lim_{x \to +\infty} \frac{2x}{\sqrt{x^2+4}}$

(b) $\lim_{x \to -\infty} \frac{2x}{\sqrt{x^2+4}}$

Does the function $f(x) = \frac{2x}{\sqrt{x^2+4}}$ have horizontal asymptotes? If yes, describe them?

3. Consider the function $f(x) = \frac{3-x}{x^2-9}$.

(a) Does this function have horizontal asymptotes? Justify your answer with limits.

(b) Does this function have vertical asymptotes? Justify your answer with limits.

(c) Graph this function.

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1. Compute each of the following limits:

(a) $\lim_{x\to 0} \frac{\sin(5x)}{x} =$ $\lim_{x\to 0} \frac{\sin(ax)}{x} =$

(b) $\lim_{x\to 0} \frac{\tan(3x)}{x} =$ $\lim_{x\to 0} \frac{\tan(bx)}{x} =$

(c) $\lim_{x\to 0} \frac{1-\cos(x)}{x}$

(d) $\lim_{x\to 0} \frac{\tan^2(3x)}{x\sin(5x)}$

(e) $\lim_{x\to 0} \frac{\sin(3x^2)+x^2}{\sin^2(3x)}$

(f) $\lim_{x\to+\infty} x\tan(3/x)$ Hint: Use the substitution technique.

(g) $\lim_{x\to+\infty} \frac{\sin(5x)}{x}$ Hint: Be careful! Here x does not go to zero!