Calculus I, Fall 2014
Quiz 9 Name: ______________________________

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (3 points) Find $\lim_{x\to\infty}(\sqrt{9x^4+x}-3x^2)$.

$$\lim_{x\to\infty}\left(\sqrt{9x^4+x}-3x^2\right) = \lim_{x\to\infty} \frac{\sqrt{9x^4+x}-3x^2}{1}\cdot\frac{\sqrt{9x^4+x}+3x^2}{\sqrt{9x^4+x}+3x^2} = \lim_{x\to\infty}\frac{9x^4+x-9x^4}{\sqrt{9x^4+x}+3x^2}$$

$$= \lim_{x\to\infty}\frac{x}{\sqrt{9x^4+x}+3x^2} = \lim_{x\to\infty}\frac{1}{\sqrt{9x^2+\frac{1}{x}}+3x} = 0$$

Problem 2: (3 points) Find $\lim_{x\to\infty} x^2\sin(1/x)$.

$$\lim_{x\to\infty} x^2\sin\left(\frac{1}{x}\right) = \lim_{x\to\infty} x\cdot\left[x\sin\left(\frac{1}{x}\right)\right] = \infty \quad \text{because}$$

$$\lim_{x\to\infty} x\sin\left(\frac{1}{x}\right) = \lim_{x\to\infty}\frac{\sin\left(\frac{1}{x}\right)}{\frac{1}{x}} = \lim_{u\to 0}\frac{\sin(u)}{u} = 1$$

Problem 3: (4 points) Find the vertical and horizontal asymptotes of the function

$$f(x) = \frac{2x^2-5}{x^2-4}.$$

H.A.: $\lim_{x\to\infty}\frac{2x^2-5}{x^2-4} = 2$, so $y=2$ is H.A.

V.A.: $x^2-4=0 \iff x=\pm 2$, so $x=2$, $x=-2$ are V.A.s