Name:

Problem 1: Find the following limits or show that it does not exist:-

1. $$\lim_{x\to\infty} \frac{\sqrt{x}+x^2}{2x-x^2}$$

2. $$\lim_{x\to\infty} \frac{\sqrt{1+4x^6}}{2-x^3} \quad \text{and} \quad \lim_{x\to-\infty} \frac{\sqrt{1+4x^6}}{2-x^3}$$

3. $$\lim_{x\to\infty} \left(\sqrt{9x^2+x}-3x\right)$$

4. $$\lim_{x\to\infty} \sqrt{x}\sin\frac{1}{x}$$

Problem 2: Find the horizontal asymptotes of the curve $y = \dfrac{x}{x^2+1}$ and use them, together with concavity and intervals of increase/decrease, to sketch the curve.

Problem 3: Use the $\epsilon - \delta$ definition of a limit to prove that $\lim_{x\to 3} x^2 = 9$ and $\lim_{x\to\infty} \frac{1}{x} = 0$.