1. Evaluate \( \lim_{x \to 3} \frac{x^2 + 2x - 15}{x^2 - 7x + 12} \)

We can factor the numerator and denominator to find

\[
\lim_{x \to 3} \frac{x^2 + 2x - 15}{x^2 - 7x + 12} = \lim_{x \to 3} \frac{(x - 3)(x + 5)}{(x - 3)(x - 4)}
\]

We can cancel the \( x - 3 \) term in the numerator and denominator and evaluate

\[
\lim_{x \to 3} \frac{x + 5}{x - 4} = \frac{8}{-1} = -8.
\]

2. Recall that \( \lim_{x \to 0} \frac{\sin(x)}{x} = 1 \). Evaluate the following limits:

a) \( \lim_{x \to 0} \frac{x}{\sin x} = 1 \). (The term is the reciprocal of \( \sin(x)/x \)).

b) \( \lim_{x \to 0} \frac{\sin 5x}{2x} \). Let \( y = 5x \) and multiply numerator and denominator by 5. Then we find

\[
\lim_{x \to 0} \frac{\sin 5x}{2x} = \lim_{x \to 0} \frac{5 \sin 5x}{2 \cdot 5x} = \lim_{y \to 0} \frac{5 \sin y}{2y} = \frac{5}{2}.
\]

c) \( \lim_{x \to 0} \frac{\sin x}{x^2} \). As \( x \to 0 \) from the right hand side we have \( \frac{\sin x}{x} \approx 1 \). So \( \frac{\sin x/x}{x} \) is roughly one divided by a small positive number so very large. As \( x \to 0 \) from the left hand side we have one divided by a small negative number so a very large negative number. Thus \( \lim_{x \to 0^+} \frac{\sin x}{x^2} = \infty \) and \( \lim_{x \to 0^-} \frac{\sin x}{x^2} = -\infty \) so the limit does not exist.