# Math 151, Quiz # 4 Solutions

**1.** Evaluate $\lim_{x\to 3} \dfrac{x^2+2x-15}{x^2-7x+12}$
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 numertor and denominator and evaluate

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

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

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

**b)** $\lim_{x\to 0} \dfrac{\sin 5x}{2x}$. Let $y = 5x$ and mulitply numerator and denominator by 5. Then we find $\lim_{x\to 0} \dfrac{\sin 5x}{2x} = \lim_{x\to 0} \dfrac{5\sin 5x}{2\cdot 5x} = \lim_{y\to 0} \dfrac{5\sin y}{2y} = \dfrac{5}{2}$.

**c)** $\lim_{x\to 0} \dfrac{\sin x}{x^2}$. As $x \to 0$ from the right hand side we have $\frac{sinx}{x} \approx 1$. 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 $\lim_{x\to 0^+} \dfrac{\sin x}{x^2} = \infty$ and $\lim_{x\to 0-} \dfrac{\sin x}{x^2} = -\infty$ so the limit does not exist.