Instructions: Work the problems below as directed. Show all work. Clearly mark your final answers. Use exact values unless the problem specifically directs you to round. Simplify as much as possible. Partial credit is possible, but solutions without work will not receive full credit.

1. Evaluate the limit numerically.

$$\lim_{x \to 0} \frac{\cos(2x) - \cos(5x)}{x^2}$$

$$= 10.5$$

Work in Excel file

2. Evaluate each of the following limits. You can use a combination of direct substitution, limit laws, and algebraic simplification techniques to find the limits. (Do not use numerical methods!)

a. $\lim_{x \to 1} e^{x-x^2} = e^{1-1^2} = e^0 = 1$

b. $\lim_{x \to 0} \frac{(2+x)^2 - 4}{x} = \lim_{x \to 0} \frac{4 + 4x + x^2 - 4}{x} = \lim_{x \to 0} \frac{x(4+x)}{x} = \lim_{x \to 0} 4 + x = 4$

c. $\lim_{x \to 16} \frac{x-16}{\sqrt{x}-4} = \lim_{x \to 16} \frac{(\sqrt{x}+4)(\sqrt{x}-4)}{\sqrt{x}-4} = \lim_{x \to 16} \sqrt{x} + 4 = \sqrt{16} + 4 = 4 + 4 = 8$

d. $\lim_{x \to 2} \frac{x^3-8}{x^2-4} = \lim_{x \to 2} \frac{(x-2)(x^2+2x+4)}{(x-2)(x+2)} = \lim_{x \to 2} \frac{x^2+2x+4}{x+2} = \frac{4+4+4}{2+2} = \frac{12}{4} = 3$