1) Differentiate:

(a) $f(x) = \sin x \cdot e^x$

(b) $f(x) = x \ln(x) - x + 3$

(c) $f(x) = 2\cos x - \sin(2x)$

(d) $f(x) = x^2 + 2e^x + \ln e$

2) Consider your answer to part (b) above and find $F(x)$, the antiderivative of $f(x) = \ln(x)$.

3) Write an equation of the tangent to the graph of $y = xe^x$ at the point $(1, e)$. Leave your answer in terms of e

4) Find the following limit by recognizing the form. Explain how you arrived at your answer.

$$\lim_{h \to 0} \frac{\cos(\pi + h) - (-1)}{h}$$

5) Verify that $y = e^x \sin(2x)$ is a solution of $y'' - 2y' + 5y = 0$