Show all work. 5 points each.

1) Write the improper integral as the limit of a proper integral, determine if it converges or diverges and find the value if it converges. Must show the antiderivative for full credit.

\[
\int_0^\infty 4e^{-4x} \, dx
\]

2) Let \( f(x, y) = 9x^2 - 3y^2 \) compute \( \frac{f(x + h, y) - f(x, y)}{h} \).

1pt extra credit what is \( \lim_{h \to 0} \frac{f(x + h, y) - f(x, y)}{h} \).