Please clearly show all your work on the following problems.

1) Find each of the following limits.

\[
\lim_{x \to 2} \frac{x^2 + 4}{x - 5} = \frac{4 + 4}{2 - 5} = \frac{8}{-3} = -\frac{8}{3}
\]

\[
\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = \lim_{x \to 2} \frac{(x - 2)(x + 2)}{x - 2} = \lim_{x \to 2} (x + 2) = 4
\]

2) Find each of the following derivatives.

\[
\frac{d}{dx} (x^6 + 4x^3 + 7) = 6x^5 + 12x^2
\]

\[
\frac{d}{dx} e^{\sin(x^2 + 2x)} = e^{\sin(x^2 + 2x)} \cdot \cos(x^2 + 2x) \cdot (2x + 2)
\]

3) Find each of the following integrals.

\[
\int_1^2 4x^3 + 7 \, dx = x^4 + 7x \bigg|_1^2 = (2^4 + 14) - (1 + 7) = 30 - 8 = 22
\]

\[
\int 2x(x^2 + 1)^5 \, dx = \int u^5 \, du = \frac{u^6}{6} + C = \frac{(x^2 + 1)^6}{6} + C
\]

\[u = x^2 + 1\]
\[du = 2xdx\]