Show all work for full credit.

1. Use the method of cylindrical shells to find the volume generated by rotating the region bounded by the given curves about the specified line. Sketch the region and a typical shell. (4 points each)

a. \( y = 2x - 1 \), \( y = -2x + 3 \), \( x = 3 \) rotated about the \( y \)-axis

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\begin{align*}
\end{align*}
\]

b. \( y = 5x - x^2 \), \( y = 0 \) rotated about the \( y \)-axis

\[
\begin{align*}
\end{align*}
\]
2. Use the method of cylindrical shells to find the volume generated by rotating the region bounded by the given curves about the specified line. Sketch the region and a typical shell. (4 points each)

a. $y = 4 - x^2$, $y = 4 - 2x$ rotated about the line $x = -2$

![Graph of a and b regions](image)

b. $x = 4 - y^2$, $y = x - 2$ rotated about the line $y = -2$

![Graph of a and b regions](image)
3. Evaluate the limits. (2 points each)

a. \( \lim_{x \to 0} \frac{\sin(5x) - 5 \sin x}{x^3} \)

b. \( \lim_{x \to 0} \frac{\tan x - x}{x^3} \)

c. \( \lim_{x \to 1} \frac{1 - x + \ln x}{1 + \cos(\pi x)} \)

d. \( \lim_{x \to \infty} x^2 \sin \left( \frac{1}{4x^2} \right) \)
4. Evaluate the limits. (3 points each)

a. \( \lim_{x \to 0} (e^x + x)^{1/x} \)

b. \( \lim_{x \to \infty} \left(1 + \frac{3}{x^2}\right)^{x^2} \)

c. \( \lim_{x \to 0} (\cos x)^{1/x^2} \)