1. By hand, showing all steps, determine \( \lim_{x \to -1} \frac{2x^2 - x - 3}{x + 1} \).

2. By hand, showing all steps, determine \( \lim_{x \to 0} \frac{\sin x}{5x} \).

3. Find \( F'(x) \).

3a. \( F(x) = f\left(\frac{1}{\sqrt{x}}\right) \).

3b. \( F(x) = \sqrt{f(x^2)} \).

3c. \( F(x) = \tan^3(f(x)) \).

4. \( x \cos y = 1 \). Find an equation of the tangent line to the graph of the curve at \( \left(2, \frac{\pi}{3}\right) \).

5. At a sand and gravel plant, sand is falling off a conveyor and into a conical pile at the rate of 10 cubic feet per minute. The diameter of the base of the cone is three times the height. At what rate is the height of the pile changing when the pile is 15 feet high? (Volume of a cone \( V = \frac{\pi}{3} r^2 h \).)

6. Determine the absolute maximum and absolute minimum on the interval \([-1, 4]\) for the function \( y = x^3 - 3x^2 \).
7. Find the critical point(s) and inflection point(s) of the curve given by 
\[ y = x^4 - 4x^3. \]

8. The sum of two nonnegative real numbers is 16. Find the maximum possible value and the minimum possible value of the sum of their cube roots.

9. Evaluate \[ \int x^2 \sin(x^3 + 1) \, dx. \]

10. Evaluate \[ \int x \sin 2x^2 \, dx. \]

11. Evaluate \[ \int_1^4 \frac{10 \sqrt{x}}{(1 + x^{3/2})^2} \, dx. \]

12. Evaluate \[ \int_0^2 \frac{x + 3}{\left(x^2 + 6x + 1\right)^3} \, dx. \]

13. Set up a definite integral to find the area between the curves 
\[ y = x^3 - 2x^2 + 10 \quad \text{and} \quad y = 3x^2 + 4x - 10. \] You need not do the integration.

14. Set up a definite integral to find the volume generated by revolving the region bounded by \[ y = x^2 + 2, \quad x = 0, \quad \text{and} \quad y = 6 \] about the \( y \)-axis. You need not do the integration.

15. Set up a definite integral to find the volume generated by revolving the region bounded by \[ y = \frac{1}{x^2}, \quad x = 1, \quad x = 4, \quad \text{and} \quad y = 0 \] about the \( y \)-axis.