1. Evaluate \( \int_0^1 (3x + 1)e^{-x} \, dx \).

2. Evaluate \( \int_3^4 \frac{x - 9}{x^2 + 3x - 10} \, dx \).

3. Evaluate \( \int_0^1 x^2(1 + 2x^3)^5 \, dx \).

4. Suppose we want to approximate \( \int_2^{5/2} \sin(x^2) \, dx \).
   (a) Find a value of \( n \) so that the midpoint approximation using \( n \) subdivisions of the interval will be within \( 1/100 \) of the value of this integral.
   (b) Write out the terms of the midpoint approximation for this value of \( n \). (Do not attempt to evaluate this sum).

5. Find the area bounded by the graphs of \( y = \sin(x) \) and \( y = 1/2 \) for \( 0 \leq x \leq \pi/2 \).

6. Determine whether the following integral converges or diverges:
   \[ \int_1^\infty \frac{1}{(3x + 1)^2} \, dx. \]
   If the integral converges, determine its value. If the integral diverges, it has no numerical value.

7. Let \( D \) be the region bounded by the graphs of \( y = e^{2x}, x = -1 \) and \( x = 2 \), and the \( x \)-axis. Find the volume of the solid that results if \( D \) is rotated about the \( x \)-axis.
   Each problem is worth 16 points. In Problem 4, (a) is worth 10 points, and (b), 6 points.