1. Find the following. [See Review for Exam II for integration tips and strategies.]

(a) $\int 12x^2 \cos(x^3) \, dx$

(b) $\int _0^\infty xe^{-3x} \, dx$

(c) $\int _0^6 \frac{dx}{(x - 4)^2}$

(d) $\int \frac{3x^2 + 2x - 5}{(x^2 + 1)(x - 4)} \, dx$

(e) $\int _0^{\pi/3} \tan^3 x \sec^5 x \, dx$
2. Find the best possible left, right, midpoint, trapezoidal, and Simpson’s approximations to \( \int_{-2}^{0} f(x) \, dx \) given the data in the table below.

<table>
<thead>
<tr>
<th>( x )</th>
<th>-2</th>
<th>-1.5</th>
<th>-1</th>
<th>-0.5</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>11</td>
</tr>
</tbody>
</table>

3. If you use numerical integration to estimate \( \int_{a}^{b} \ln x \, dx \), how would the following be ordered from least to greatest? \( L_{100}, R_{100}, M_{100}, T_{100}, S_{200} \). What can you say with certainty about where \( \int_{a}^{b} \ln x \, dx \) would fit into your ordering?
4. Find bounds for each of the following errors if \( I = \int_0^2 e^{-3x} \, dx \).

(a) \( |I - L_{100}| \)

(b) \( |I - T_{100}| \)

(c) \( |I - M_{100}| \)

5. If \( I = \int_0^2 e^{-3x} \, dx \), how many subdivisions are required to obtain a midpoint sum approximation with error of at most 1/1,000,000?

6. Use Euler’s Method with 3 steps to estimate \( y(3/4) \) if \( dy/dx = y - 3 \) and \( y(0) = 1 \).

7. Write an integral equal to the area between \( y = 2x + 3 \) and \( y = x^2 + 7x - 3 \).
8. Compute the arc length of $y = \sqrt{1 - x^2}$ from $x = 0$ to $x = 1/2$.

9. Consider the region bounded by $y = 0$, $x = 2$, and $y = x^2$. Write an integral equal to the volume of the object created when the region is revolved about

(a) the $x$-axis

(b) the line $x = 5$

10. Find the solution to $\frac{dy}{dx} = \frac{\cos x}{y^2}$ that passes through $(0, 2)$.