You may include your answers to 2, 3, 11 on this sheet. Answers to the remaining problems should be written on a separate piece of paper.

1. A cyclist must ride 100 meters to the top of a hill. Her velocity (in meters per second) is recorded at two-second intervals.

<table>
<thead>
<tr>
<th>time</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>v(t)</td>
<td>0</td>
<td>4.72</td>
<td>11.91</td>
<td>15.73</td>
<td>17.32</td>
</tr>
</tbody>
</table>

Does the cyclist reach the top of the hill in 8 seconds? Explain.

2. The graph below is of the function $y = f(x)$. Put the following in increasing order:

\[ A = \int_{-3}^{3} f(x)dx \quad B = \int_{0}^{3} f(x)dx \quad C = \int_{3}^{5} f(x)dx \quad D = \int_{0}^{5} f(x)dx \]

\[ _____ < _____ < _____ < _____ \]

3. A graph of $y = f(x)$ is given below.

(a) Estimate $\int_{0}^{24} f(x)dx$ using a right-hand sum with $\Delta x = 8$.

(b) Draw rectangles on the graph representing the right-hand sum with 3 subdivisions.

(c) Estimate $\int_{0}^{24} f(x)dx$. 

4. The RATE at which ketchup was used during March in a local restaurant is given by
\[ K(t) = 4 + 0.3 \sin t, \]
where \( K \) is measured in liters per day and \( t \) is the number of days since the beginning of March. What does
\[ \int_{0}^{10} K(t) \, dt \]
represent in practical terms? Do not evaluate the definite integral.

5. Find \( g'(x) \) where \( g(x) = \int_{0}^{x} t^2 \sin t \, dt \).

6. Find an antiderivative of \( f(x) = \sqrt{x} + \sin x \).

7. Find the indefinite integral \( \int \left( \frac{2}{x} + \cos x \right) \, dx \).

8. Find the indefinite integral \( \int \left( 2^x + \sec^2 x \right) \, dx \).

9. Find a function \( F(x) \) such that \( F'(x) = x^2 + e^x \) and \( F(0) = 4 \).

10. (a) Verify that the function \( F(t) = t \sin t + 3 \) is an antiderivative for \( f(t) = t \cos t + \sin t \).

   (b) Use the fundamental theorem of calculus to evaluate \( \int_{0}^{\pi/2} (t \cos t + \sin t) \, dt \).

11. The graph of the derivative, \( f'(x) \), of a function, \( f(x) \), is given below. Sketch a graph of \( f(x) \) provided that \( f(0) = 10 \). Be sure that your graph clearly shows the main features of \( f \) such as local maxima and minima and inflection points.

   Fill in the following table:

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

   \[ y \]
   \[ 20 \]
   \[ 10 \]
   \[ 0 \]
   \[ 10 \]
   \[ 20 \]
   \[ 30 \]

   \[ x \]