1. What is the exact average value of \( g(x) = \sqrt{x(x^2 - 2x + 1)} \) over the interval \( 1 \leq x \leq 4 \)?

2. Find the exact equation of the tangent line to \( f(x) = \int_3^{\sqrt{x}} e^{-t^2} \, dt \) at \( x = 9 \).

3. Evaluate the following integrals quickly. You do not have to show any work (but mentally differentiate to check your answer).

\[
\begin{align*}
(a) & \quad \int \cos(7x + 4) \, dx \\
(b) & \quad \int \frac{2x + 1 + \sec^2 x}{x^2 + x + \tan x} \, dx \\
(c) & \quad \int \frac{2}{10x - 5} \, dx \\
(d) & \quad \int e^{3x^2 + 40} \, dx \\
(e) & \quad \int \frac{1}{(50x + 10)^2 + 1} \, dx \\
(f) & \quad \int (-2x + 5)^{5/7} \, dx
\end{align*}
\]

4. Use the graph of \( y = f(x) \) below to order the following quantities from least to greatest. Illustrate (c), (d), and (e) graphically.

(a) \( f(2) \)
(b) \( f(2) - f(0) \)
(c) \( f'(0) \)
(d) \( f'(-1) \)
(e) \( \frac{f(0) - f(-1)}{0 - (-1)} \)
(f) \( \int_0^6 f(x) \, dx \)

5. The following table gives some numerical information about the derivative of a function \( f(x) \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f'(x) )</td>
<td>1.0</td>
<td>2.6</td>
<td>3.4</td>
<td>3.8</td>
<td>4.0</td>
<td>4.1</td>
</tr>
</tbody>
</table>

What is the concavity of \( f(x) \) when \( x \) is between 0 and 1? Explain.

6. Evaluate the following integrals using substitution:

\[
\begin{align*}
(a) & \quad \int e^{x^3 + 2x + 1}(3x^2 + 2) \, dx \\
(b) & \quad \int (x^2 + 2x + 7)^{50}(x + 1) \, dx \\
(c) & \quad \int \sin^3 x \cos x \, dx \\
(d) & \quad \int \frac{\sin \sqrt{x}}{\sqrt{x}} \, dx \\
(e) & \quad \int x^2 \sec^2(x^3) \, dx \\
(f) & \quad \int \frac{x^2 + 2}{\sqrt{x - 5}} \, dx
\end{align*}
\]

7. The temperature \( T \), in degrees Fahrenheit, of a warm tasty beverage placed in a cold refrigerator is given by \( T = f(t) \), where \( t \) is the time in minutes since the yummy beverage was put in the fridge.

(a) What are the units of \( dT/dt \)?
(b) Suppose that \( f(10) = 60 \) and that \( f'(10) = -3 \). What was the approximate temperature of the beverage 8 minutes after it was put in the fridge?