(1) (10 points) For the following functions draw the graph of the derivative on the same axis.
(a) 

(b) 

(2) (5 points) Draw a possible graph for a function given the following information.
• $f'(x) > 0$ for $1 < x < 4$,
• $f'(x) < 0$ for $x < 1$ and $x > 4$. 
(3) (15 points) Let $f(x)$ have values as given in the following table.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>22</td>
<td>28</td>
<td>32</td>
<td>30</td>
<td>26</td>
</tr>
</tbody>
</table>

(a) Make a table of values of $f'(x)$.

(b) Make a table of values for $f''(x)$.

(c) Give an approximation of the value of $f'(2.8)$.

\[ f'(2.8) \approx \] 

(4) (10 points) A cold drink is left out in a warm room. Let $f(t)$ be the temperature, in degrees Celsius, of the drink $t$ minutes after being left out.

(a) Do you expect $f'(t)$ to be positive or negative? Give a reason for your answer.

(b) What are the units of $f'(t)$?
(5) (10 points) Draw graphs of functions with the following properties
(a) \( f'(x) < 0, \ f''(x) < 0 \)

(b) \( f \) is increasing at an increasing rate.

(c) \( f(1) = 2, \ f'(1) = 0, \ f''(x) < 0 \).

(6) (10 points) Find the equation of the tangent line to \( y = x - x^3 \) at the point where \( x = 2 \).

(7) (5 points) Let \( f(x) = \frac{e^x}{\sqrt{x^2 + 1}} \). Then use your calculator to compute \( f'(3.1) \).

\[ f'(3.1) = \]
(8) (10 points) For some painkillers, the size of the dose, \( D \), given depends on the weight of the patient, \( W \). Thus \( D = f(W) \), where \( D \) is in milligrams and \( W \) is in pounds.
(a) Interpret \( f(140) = 120 \) and \( f'(140) = 3 \) in terms of this painkiller.

(b) Use the information in part (a) to estimate \( f(145) \).

\[
\begin{align*}
f(145) \approx & \quad \phantom{120} \quad \phantom{3}
\end{align*}
\]

(9) (30 Points.) Find the derivatives of the following functions.
(a) \( y = 4x^3 - 7x^2 + 5x - 9 \)

\( y' = \)

(b) \( z = \frac{3}{t^2} + 5\sqrt{t} + e^t \)

\( z' = \)

(c) \( A(r) = 3e^r + 19(3.2)^r \)

\( f'(t) = \)

(d) \( Q = 4 \ln(P) \)

\[
\frac{dQ}{dP} =
\]

(e) \( V(r) = 2e^{3r} + (r^3 + r)^4 \)

\( V'(r) = \)
(f) \( y = 4 \ln(2x + 1) \)

\[ y' = \]

(g) \( y = 5e^{2x^3} \)

\[ y' = \]

(h) \( y = xe^x \)

\[ y' = \]

(i) \( w = \sqrt{z^2 + z} - 2 \ln(3z^2 + z) \)

\[ w' = \]

(j) \( y = \frac{x^2 + 1}{x + 1} \)

\[ y' = \]