TEST #1

Open note, point values are in the brackets. Time: 50 minutes.

[8] 1. Suppose that \( f(x) \) is a function with \( f(50) = 50 \) \( f'(50) = -2 \).
   Estimate \( f(52) \). Show your work.

[8] 2. Find average rate of change of function
   \[ f(x) = x^3 + x^2 \]
   between \( x = 1 \) and \( x = 2 \). Show your work.

[8] 3. Find possible formula for the following graph:
4. Determine whether \( f', f', f'' \) are positive, negative or zero at the points A, B, C shown in the figure below (write the results \(+, -, 0\) in the table):

<table>
<thead>
<tr>
<th></th>
<th>( f )</th>
<th>( f' )</th>
<th>( f'' )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. For the function presented in the graph below determine (approximately)

(a) \( x \) and \( y \) intercepts

(b) domain and range
6. A town has 2000 people initially. In each of the cases below, find the formula for the population of the town, \( P \), in terms of number of years, \( t \).

[4] (a) The town grows at an annual rate of 4 % per year.

[4] (b) The town shrinks by 50 people per year.

[8] 7. A fishery stocks a pond with 1000 young trout. The number of trout \( t \) years later is given by

\[
P(t) = 1000 \times 1.2^t
\]

In how many years will the number of trout reach 1500? Show your work.

8. A mutual fund is currently (at \( t = 0 \) days) valued at $20 per share and its value per share is increasing at a rate of $2 a day.

[2] (a) Express information given about the mutual fund in terms of \( f \) and \( f' \).

[6] Assuming that the rate of growth stays constant, estimate and interpret \( f(5) \). Show your work.
9. Sketch the graph of $f'(x)$:

[Graph of $f(x)$]

10. Values of $f(t)$ are given in the following table:

<table>
<thead>
<tr>
<th>$t$</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(t)$</td>
<td>21</td>
<td>19</td>
<td>16</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Estimate $f''(t)$. Show your work.
11. For the function $f(x)$ graph $y = 2f(x) - 1$.

12. Using the same coordinate axes, give rough sketches, for $x > 0$, of the graphs of $y = x^{-4}$, $y = x^0$, $y = x^{1/5}$.