1. Given the graph of $y = f(x)$ in Figure 1, answer the questions below.

![Graph of $y = f(x)$]

(a) Of the four marked $x$ values, $f(x)$ is positive at $x_2$ and $x_4$ and negative at $x_0$ and $x_1$.
(b) Of the four marked $x$ values, $f'(x)$ is positive at $x_1$ and $x_2$ and negative at $x_0$ and $x_4$.
(c) Of the four marked $x$ values, $f(x)$ is greatest at $x_2$ and least at $x_0$.
(d) Of the four marked $x$ values, $f'(x)$ is greatest at $x_1$ and least at $x_4$.

2. Graph derivative of the function $g(x)$ shown in Figure 3.

The derivative $g'$ has zeros at approximately $x = 1$ and $x = 4.5$ where $g$ has a horizontal tangent line at the turning points. $g'$ will be positive when $g$ is increasing: the interval $1 < x < 4.5$. $g'$ will be negative when $g$ is decreasing: the intervals $0 < x < 1$ and $4.5 < x < 7$.

![Graph of $y = g(x)$ and $y = g'(x)$]

Figure 2: Graph of $y = g(x)$ on left and corresponding $y = g'(x)$ on right.
3. Draw the graph of a function $y = m(x)$ that satisfies the following three conditions:

- $m'(x) > 0$ for $x < -2$.
- $m'(x) < 0$ for $-2 < x < 2$.
- $m'(x) = 0$ for $x > 2$.

One possible example is given below. Others may be possible.
Figure 4e shows the total number of unemployed workers in the state of Illinois in the years 2000 to 2010. Let \( N \) denote the number of unemployed people and \( t \) the year.

![Illinois Total Unemployed People](image)

Figure 3: Number of unemployed people in Illinois, \( N \), as a function of year.

(a) The rate at which the number of unemployed people in Illinois was changing in 2006.

(b) Using \( N(2006) \approx 330,000 \) and \( N(2006.5) \approx 300,000 \) we have

\[
N'(2006) \approx \frac{N(2006.5) - N(2006)}{0.5} = \frac{-30,000}{0.5} = -60,000
\]

(c) Unemployment was greatest in 2010 and least in 2000.

(d) Unemployment was rising fastest in period from 2009 to 2010. Unemployment was falling fastest around 2006.

(e) Sketch an approximate graph for \( N'(t) \).