1. According to MVT $f'(c)$ must equals to the slope of the secant line that connects $f(0)$ and $f(3)$, so that $c \in (0,3)$. First we have to find what is the average rate of the function over the given interval.

   $$m_{avg} = \frac{f(3) - f(0)}{3 - 0} = \frac{0}{3} = 0$$

   Now we need to find $f'(x)$.

   $$f'(x) = 3x^2 - 6x$$

   Solve for $f'(c) = 0$.

   $$\begin{aligned} 3c^2 - 6c = 0 / : c \text{ (x=0 is not on our interval)} \\ c = 2 \end{aligned}$$

2. It tells us that the function f has absolute maximum and minimum on $< -2, 2 >$

3. We must find $f'(x)$ and then solver for $f'(x) = 0$. Those points where the derivative is 0 are points where the function *usually* changes from decreasing to increasing and vice versa.

   $$\begin{aligned} f'(x) = 8(2x+1)^3 \\ 0 = 8(2x+1)^3 \Rightarrow x = -0.5 \end{aligned}$$

   Now the domain of f was split into $x < -0.5$ and $x > -0.5$. Now we take number from each interval and plug it in $f'(x)$ to see whether it is positive or negative.

   $x < -0.5 \rightarrow f'(x) > 0(increasing)$

   $x > -0.5 \rightarrow f'(x) > 0(increasing)$

   The function is increasing on its domain (all real numbers).

4. The global minimum of this quadratic function on $< -4, 2 >$ will be there where $f'(x) = 0$ and $f''(x) > 0$.

   $$f'(x) = 2x + 2 \Rightarrow x = -1$$

   We don't need to find the second derivative because the quadratic polynomial member is positive. We know for sure that the mimimum will be at $x = -1$. We just need to solve for $f(-1)$.

   $$f(-1) = -6$$

   The global minimum is -6.

5. To determine the concavity of graph of the function f we need to be looking at at f''. The second derivative of $f''(x) = e^x$. We know that exponential functions are always larger than zero $f''(x) > 0$. The function f will be concave up on the given interval.

6. The function has an inflex point at $x = 0$ because $f''(0) = 0$. And the graph is concave down at $x = -1$ and concave up at $x = 1$. If $x = 0$ is the only point of inflection of the function f then the graph of the function f is concave down on $(-\infty, 0)$ and concave up on $(0, \infty)$.

   The graph of the function f has one inflection point at $x = 3$. The function is concave up on $(-6, 3)$ and concave down on $(3, 4)$. $f(-3)$ is relative minimum because $f''(-3) > 0$.

7.