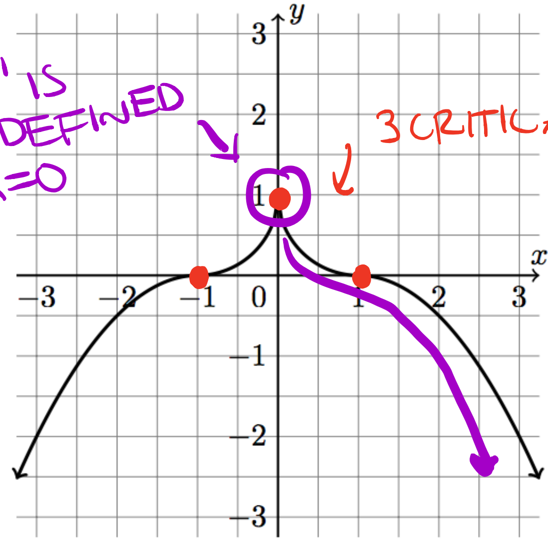
4. How many of the following statements are true concerning the graph of $f(x)$ given below

f' IS UNDEFINED AT x=0




3 CRITICAL #'S (WHERE f'(x)=0 OR IS UNDEFINED)

(i) $f''(x) \geq 0$ for all $x$-values between $-1$ and $1$ f'' DNE AT x=0 B/C f' DNE @ x=0!

(ii) $f(x)$ has exactly two critical numbers f HAS 3 CRITICAL #'S

(iii) $f(x)$ has exactly one local minimum NO

(iv) $f'(x) \leq 0$ for all $x \geq 0$ f' IS NOT DEFINED AT x=0

(A) 0 ~~(B) 1~~ ~~(C) 2~~ ~~(D) 3~~ ~~(E) 4~~

$*\ \Delta y = f(x+\Delta x) - f(x)$

3. The elevation $h$ (in feet above the ground) of a stone dropped from a height of 500 ft is modeled by the equation $h(t) = 500 - 16t^2$, where $t$ is measured in seconds and air resistance is neglected. Use differentials to approximate the change in elevation over the interval $3 \le t \le 3.1$ seconds.

(A) $\Delta h \approx -4.8$ ft (B) $\Delta h \approx -9.6$ ft (C) $\Delta h \approx -118$ ft (D) $\Delta h \approx -846.4$ ft (E) None of the above

$\Delta t = 3.1 - 3 = 0.1$

NEW − OLD

$t = 3$

$\Delta h = f(t+\Delta t) - f(t)$

$\Delta h = f(3+0.1) - f(3)$

$\Delta h = f(3.1) - f(3)$

$\Delta h = 346.24 - 356$

$\Delta h = -9.76$

$f(3.1) = 500 - 16(3.1)^2$

$= 500 - 16(9.61)$

$= 500 - 153.76$

$= 346.24$

$f(3) = 500 - 16(3)^2$

$= 500 - 144$

$= 356$

$f'(x) = -2x + 4 - 2e^x \longrightarrow f''(x) = -2 - 2e^x = -2(1+e^x)$

$f'(0) = -2(0) + 4 - 2e^0$

$= 4 - 2$

$= 2$

$f'(0) = 2 > 0 \Rightarrow$ f IS INCREASING AT $X=0$

$f''(x) = 0 \Rightarrow -2(1+e^x) = 0$

$1 + e^x = 0$

$e^x = -1$

NOT POSSIBLE

$\Rightarrow$ NO INFLECTION POINTS

6. If $f(x) = -x^2 + 4x + 3 - 2e^x$, then how many of the following are true:

(i) The graph of the function is concave upward at $x = 0$.

(ii) The function is increasing at $x = 0$ *

(iii) The function has two inflection points

(iv) The function is concave downward at $x = \ln 2$

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

$f''(x) = -2 - 2e^x$

$f''(0) = -2 - 2e^0$

$= -2 - 2 = -4 < 0$

$f''(0) < 0 \Rightarrow$ f IS CONCAVE DOWN AT $X=0$

$f''(\ln(2)) = -2 - 2e^{\ln 2}$

$= -2 - 2(2)$

$= -2 - 4 = -6 < 0$

$\Rightarrow$ f'' CONCAVE DOWN AT $X = \ln 2$