Name: ANSWERS Lehman ID: _____

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MAT175 (Spring 2019)
Quiz 4

1. Consider the function $f(x) = x^3 - 3x^2 - 9x + 3$.

   a) **(4 pts)** Find all critical points of $f(x)$.

   b) **(3 pts)** Determine for which values of x is $f(x)$ increasing / decreasing and use this to classify the critical points into local minima / local maxima / neither.

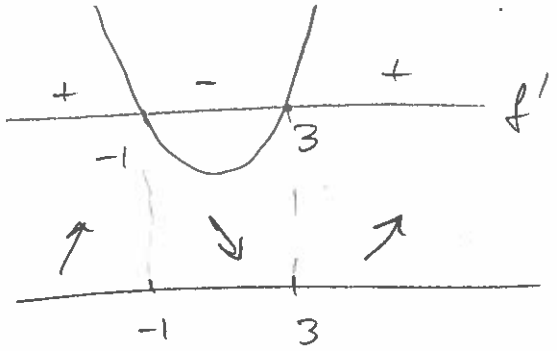
   c) **(3 pts)** Find the global minimum and maximum of $f(x)$ in the interval $[-3, 2]$.

a) $f'(x) = 3x^2 - 6x - 9 = 3(x^2 - 2x - 3) = 0 \iff x = -1$ or $x = 3$

Critical points are $x = -1$ and $x = 3$

b) $f'(x) = 3(x^2 - 2x - 3) > 0 \iff x < -1$ or $x > 3$

$< 0 \iff -1 < x < 3$



Thus: $f(x)$ is increasing on $(-\infty, -1)$ and $(3, +\infty)$ and decreasing on $(-1, 3)$.

$x = -1$ is therefore a local maximum

$x = 3$ is therefore a local minimum

c) On the interval $[-3, 2]$, other than the critical pt $x = -1$, need to check the endpoints:

$f(-3) = -27 - 3 \cdot 9 + 9 \cdot 3 + 3 = -24 \leftarrow$ smallest

$f(2) = 8 - 12 - 18 + 3 = 11 - 30 = -19$

$f(-1) = -1 - 3 + 9 + 3 = 8 \leftarrow$ largest

Global minimum: $f(-3) = -24$

Global maximum: $f(-1) = 8$

Extra: Sketch of graph