Put answers in spaces provided unless otherwise stated. SHOW ALL WORK. (No Work = No Credit)
Remember that you lose points for sloppy work, not following directions, and unclear answers. Simplify answers completely. Quiz is due AT THE BEGINNING OF CLASS on Monday, April 1.

(9 points)

1. Find the absolute maximum and minimum, if either exists, for \( f(x) = x^4 - 8x^2 - 16 \) on each given interval.

   \[
   f'(x) = 4x^3 - 16x
   \]

   a. \([-1, 3]\]

   \[
   0 = 4x^3 - 16x
   \]

   \[
   0 = x^3 - 4x
   \]

   \[
   0 = x(x^2 - 4)
   \]

   \[
   0 = x(x - 2)(x + 2)
   \]

   \[
   x = 0, x = 2, x = -2
   \]

   on \([-1, 3]\), check \(-1, 0, 2, 3\)

   \[
   f(-1) = (-1)^4 - 8(-1)^2 + 16 = 1 - 8 + 16 = 9
   \]

   \[
   f(0) = 0^4 - 8 \cdot 0^2 + 16 = 16
   \]

   \[
   f(2) = 2^4 - 8 \cdot 2^2 + 16 = 16 - 32 + 16 = 0
   \]

   \[
   f(3) = 3^4 - 8 \cdot 3^2 + 16 = 81 - 72 + 16 = 25
   \]

   abs. max of 25 at \( x = 3 \)

   abs. min of 0 at \( x = 2 \)

   b. \([0, 2]\)

   on \([0, 2]\), check \(0, 2\)

   \[
   f(0) = 16
   \]

   \[
   f(2) = 0
   \]

   abs. max of 16 at \( x = 0 \)

   abs. min of 0 at \( x = 2 \)
2. Summarize the pertinent information obtained by applying the graphing strategy and sketch the graph of 
\[ y = f(x) = \frac{2x}{x^2 - 16}. \] Work must be clear and complete to receive full credit.

1. \[ D: \ x^2 - 16 \neq 0 \]
   \[ (x-4)(x+4) \neq 0 \]
   \[ x \neq 4, \ x \neq -4 \]
   \[ (-\infty, -4) \cup (-4, 4) \cup (4, \infty) \]

2. \[ f'(x) = \frac{(x^2 - 16)(2) - (2x)(2x)}{(x^2 - 16)^2} = \frac{2x^2 - 32 - 4x^2}{(x^2 - 16)^2} = \frac{-2x^2 - 32}{(x^2 - 16)^2} \]
   \[ 0 = -2x^2 - 32 \]
   \[ 2x^2 = -32 \]
   \[ x^2 = -16 \]

3. \[ f''(x) = \frac{4x(x^2 + 48)}{(x^2 - 16)^3} \]
   \[ 4x(x^2 + 48) = 0 \]
   \[ x = 0 \]

(see next pg)
\[ f''(x) = \frac{(x^2 - 16)^2 (-4x) - (2x^2 - 32) \left[ 2(x^2 - 16)(2x) \right]}{(x^2 - 16)^4} \]

\[ = \frac{(x^2 - 16)^2 (-4x) + (2x^2 + 32) \left[ 4x(x^2 - 16) \right]}{(x^2 - 16)^4} \]

\[ = \frac{4x(x^2 - 16) \left[ - (x^2 - 16) + (2x^2 + 32) \right]}{(x^2 - 16)^4} \]

\[ = \frac{4x \left[ -x^2 + 16 + 2x^2 + 32 \right]}{(x^2 - 16)^3} \]

\[ = \frac{4x \left( x^2 + 48 \right)}{(x^2 - 16)^3} \]