1. Sketch the graph of a single function that has all of the following properties:

   (a) Continuous everywhere.

   (b) $f'(x) > 0$ if $|x| < 2$.

   (c) $f'(x) < 0$ if $|x| > 2$.

   (d) $f'(-2) = 0$.

   (e) $f$ is not differentiable at $x = 2$.

   (f) $\lim_{x \to 2} |f'(x)| = \infty$.

   (g) $f''(x) > 0$ if $x \neq 2$.

   (h) $f(2) = 3$. 

Score count
0 5 10 15 20
0 2 4 6 8 10
Score
0 5 10 15 20
0 2 4 6 8 10

Count
2. Let \( f(x) = 2x^3 - 3x^2 - 12x + 3 \)

/10 (a) Find the intervals where \( f \) is increasing, and the intervals where it is decreasing.

/10 (b) Find the intervals where \( f \) is concave up, and the intervals where it is concave down.

/10 (c) Find the absolute maximum and minimum values of \( f \) on the interval \([-2, 0]\).
3. For the function

\[ f(x) = \frac{x}{x^2 - 9} \]

(a) Find the \(x\)- and \(y\)-intercepts.
(b) Find any asymptotes.
(c) Find the intervals on which \(f\) is increasing or decreasing.
(d) Find the local maximum and minimum values of \(f\).
(e) Find the intervals of concavity and the inflection points.
(f) Use the information above to sketch the graph.
4. (a) State the Mean Value Theorem (MVT).

(b) State why the function

\[ f(x) = x^3 - 3x + 2 \]

on the interval \([-2, 2]\) satisfies each of the hypotheses of the MVT on the given interval. Then find all numbers \(c\) that satisfy the conclusion of the MVT.

5. Compute the following:

(a) \[ \frac{d}{dx} [x^x] = \]

(b) \[ \lim_{x \to \infty} x^x = \]

(c) \[ \lim_{x \to 0^+} x^x = \]
Total