Calculus Name_____

Review Extrema, Rolles and Mean Value Theorem, and Increasing and Decreasing

For each problem, find all points of absolute minima and maxima on the given interval.

1) $y = -x^3 - 9x^2 - 24x - 15;\ \ [-4, -1]$

2) $y = -x^2 - 8x - 16;\ \ [-6, -3]$

3) $y = -x^3 + 2x^2 - 4;\ \ (-1, 2)$

4) $y = -x^3 + x^2;\ \ (-1, 1)$

5) $y = x^3 - x^2 + 1;\ \ [-1, 2)$

6) $f(x) = -x^3 + 2x^2 + 2;\ \ (0, 3]$

7) $f(x) = -x^4 + 2x^2 - 2;\ \ [0, \infty)$

8) $y = -x^3 + 9x^2 - 24x + 15;\ \ [4, \infty)$

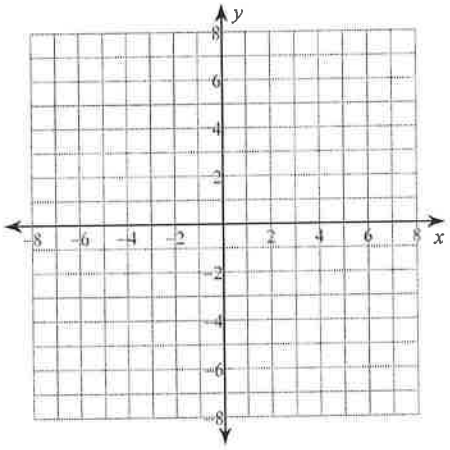
For each problem, find all points of relative minima and maxima.

9) $y = -x^4 + x^2 + 3$

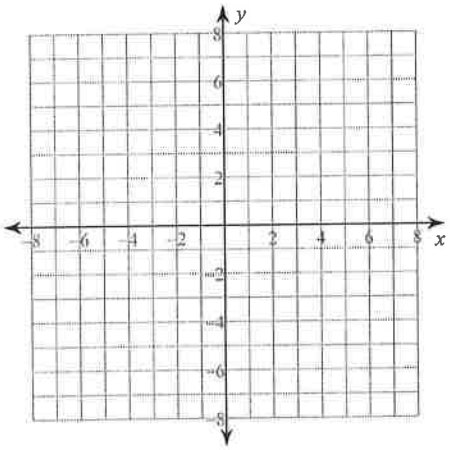
10) $y = -\dfrac{4x}{x^2 + 4}$

For each problem, find the values of c that satisfy Rolle's Theorem. Use the provided graph to sketch the function.

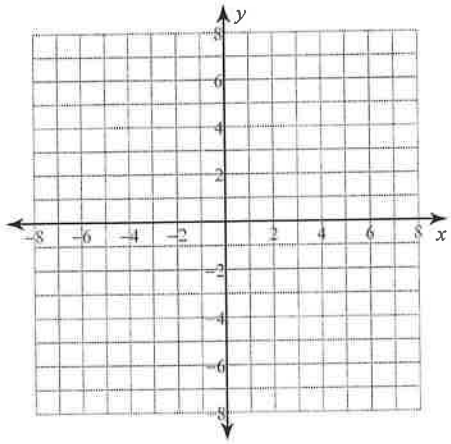
11) $y = 2x^2 - 12x + 13;\ \ [2, 4]$



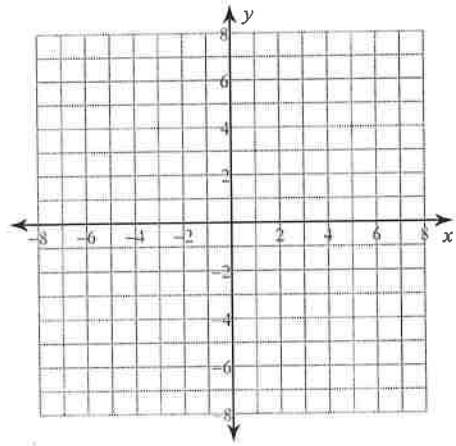
12) $y = -x^2 - 4x - 2;\ \ [-3, -1]$



13) $y = 2x^2 + 12x + 19$; $[-4, -2]$

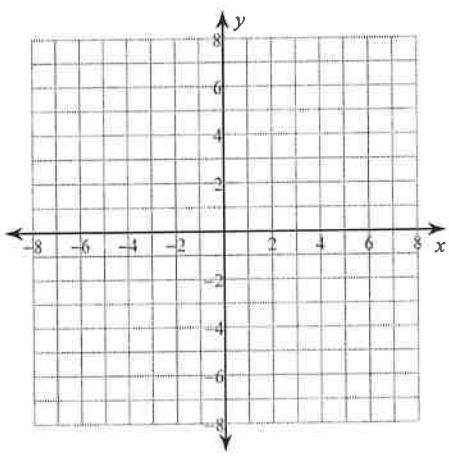


14) $y = -x^3 + 4x^2 + x - 5$; $[-1, 4]$

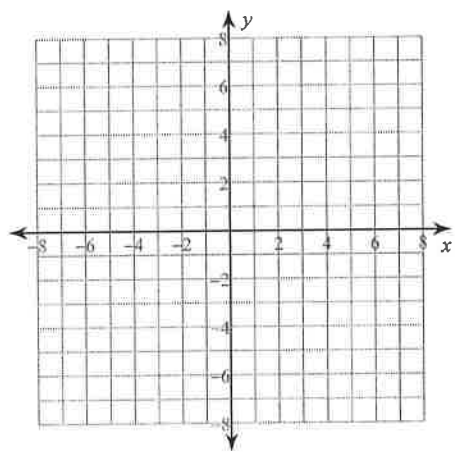


For each problem, determine if Rolle's Theorem can be applied. If it can, find all values of *c* that satisfy the theorem. If it cannot, explain why not. Use the provided graph to sketch the function.

15) $y = \dfrac{-x^2 + x + 20}{-x + 6}$; $[-4, 5]$

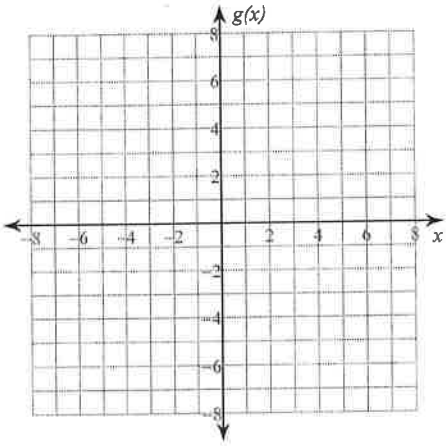


16) $y = \dfrac{-x^2 + 4}{3x}$; $[-2, 2]$

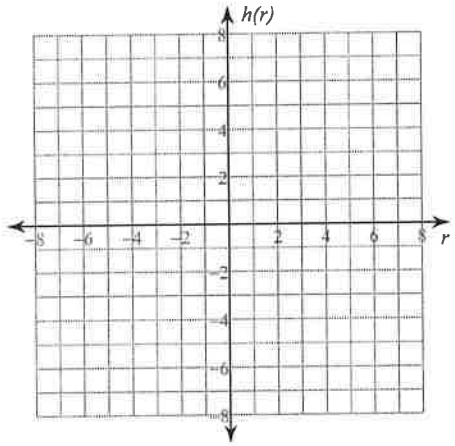


For each problem, find the values of c that satisfy the Mean Value Theorem. Use the provided graph to sketch the function.

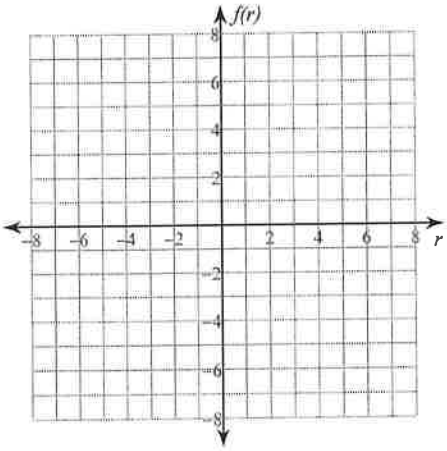
17) $g(x) = 2x^2 - 1;\ \ [-2, 0]$



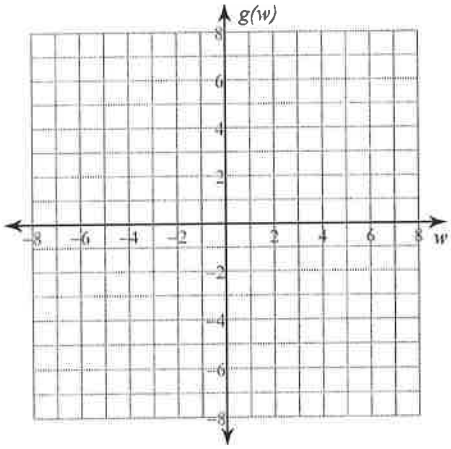
18) $h(r) = -(5r + 25)^{\frac{2}{3}};\ \ [-5, -3]$



19) $f(r) = -2r^2 + 4r - 4;\ \ [0, 2]$

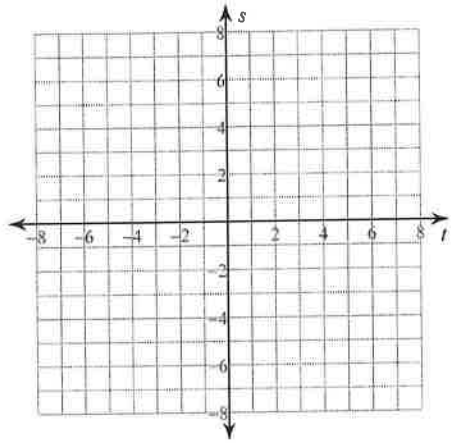


20) $g(w) = -(w - 1)^{\frac{2}{3}};\ \ [1, 5]$

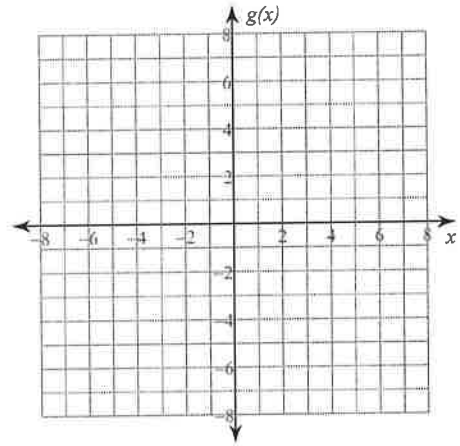


For each problem, determine if the Mean Value Theorem can be applied. If it can, find all values of c that satisfy the theorem. If it cannot, explain why not. Use the provided graph to sketch the function.

21) $s = \dfrac{t^2 - 9}{2t}$; $[1, 6]$

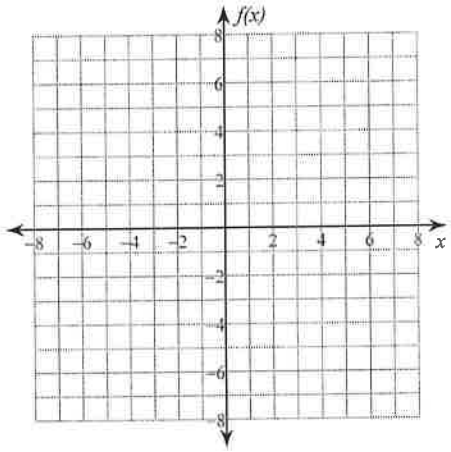


22) $g(x) = (2x + 6)^{\frac{2}{3}}$; $[-4, -1]$

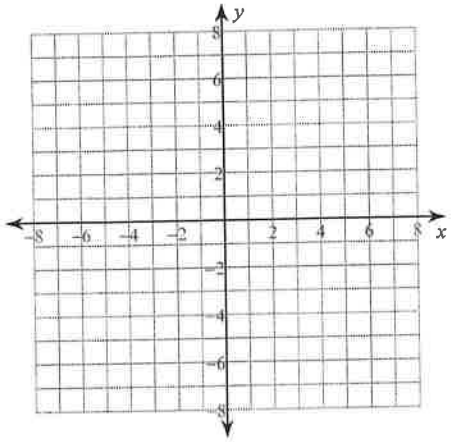


For each problem, find the x-coordinates of all critical points, find all discontinuities, and find the open intervals where the function is increasing and decreasing. Use the provided graph to sketch the function.

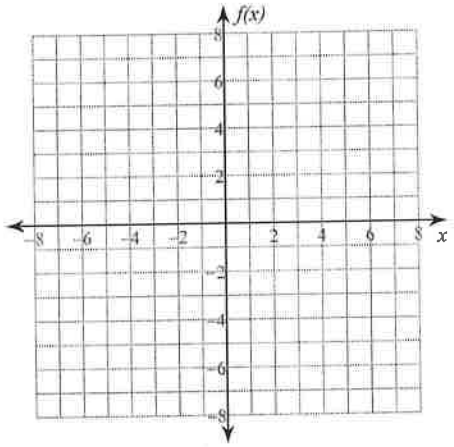
23) $f(x) = x^3 - 3x^2 - 3$



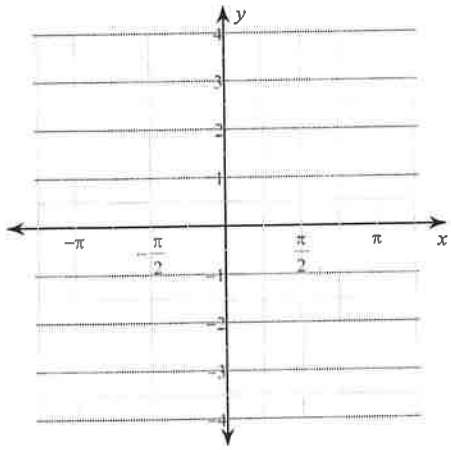
24) $y = x^3 - x^2 - 1$



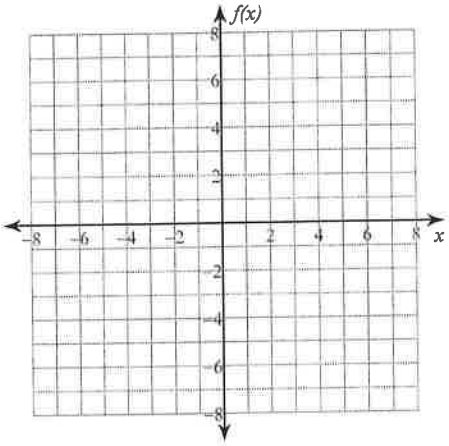
25) $f(x) = -x^5 + 2x^3 + 4$



26) $y = \sin(x)$; $[-\pi, \pi]$



27) $f(x) = -\dfrac{3}{x+1}$



28) $f(x) = -x^3 + x^2 - 2$