3.2 Rolle's Theorem and the Mean Value Theorem

ex: List the critical numbers of f(x).

$$f(x) = x^{4/5}(x-5)^2$$

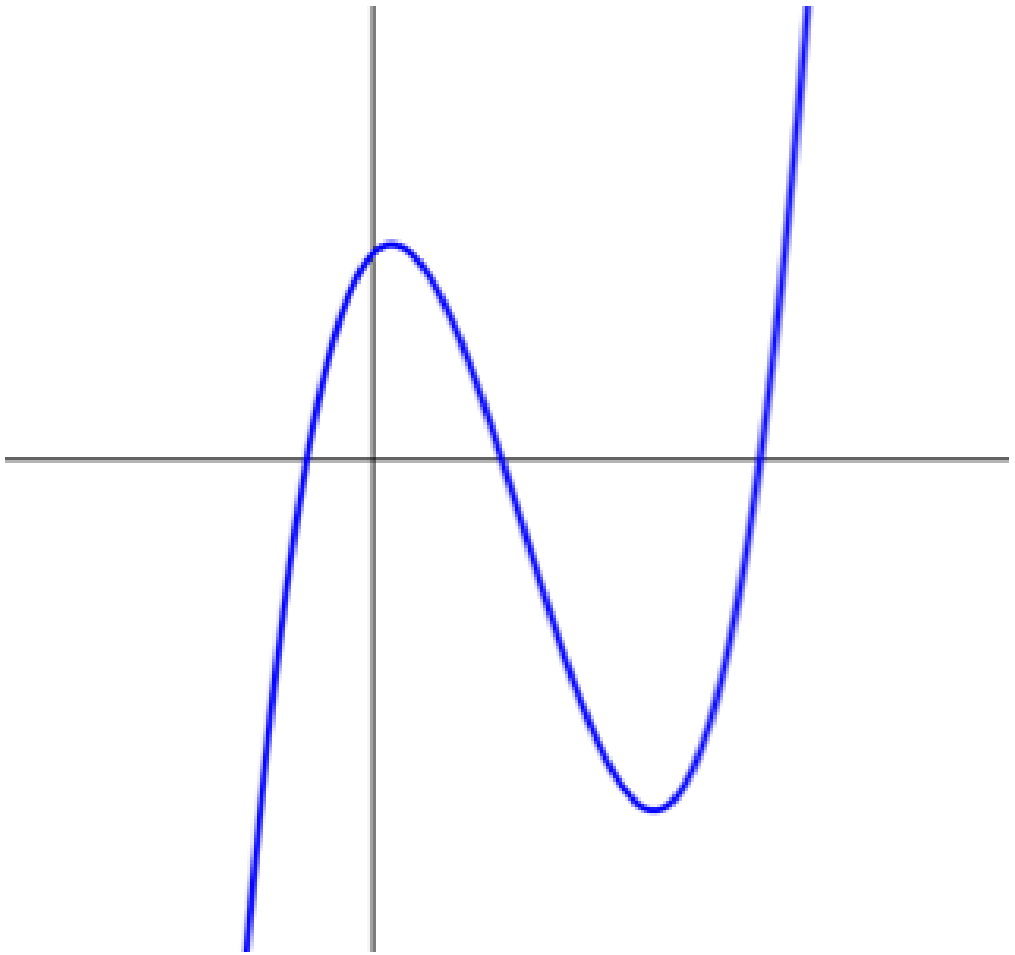
ex: Find the maximum and miniumum values of f(x) on the indicated interval.

$$f(x) = \sin x + \cos x, \qquad \left[0, \frac{\pi}{2}\right]$$

THEOREM 3.4 The Mean Value Theorem

If f is continuous on the closed interval $[a, b]$ and differentiable on the open interval (a, b), then there exists a number c in (a, b) such that

The Graphical Interpretation of the Mean Value Theorem.



ex: Determine the value(s) of c guaranteed by the conclusion of the MVT on the given interval, if possible.

a) $f(x) = 5 - \frac{4}{x}, \quad [1,4]$

ex: Determine the value(s) of c guaranteed by the conclusion of the MVT on the given interval, if possible.

b) $f(x)=\sqrt{x-4}, \quad [4,8]$

ex: Determine the value(s) of c guaranteed by the conclusion of the MVT on the given interval, if possible.

c) $f(x)=\frac{1}{x}, \quad [-1,1]$

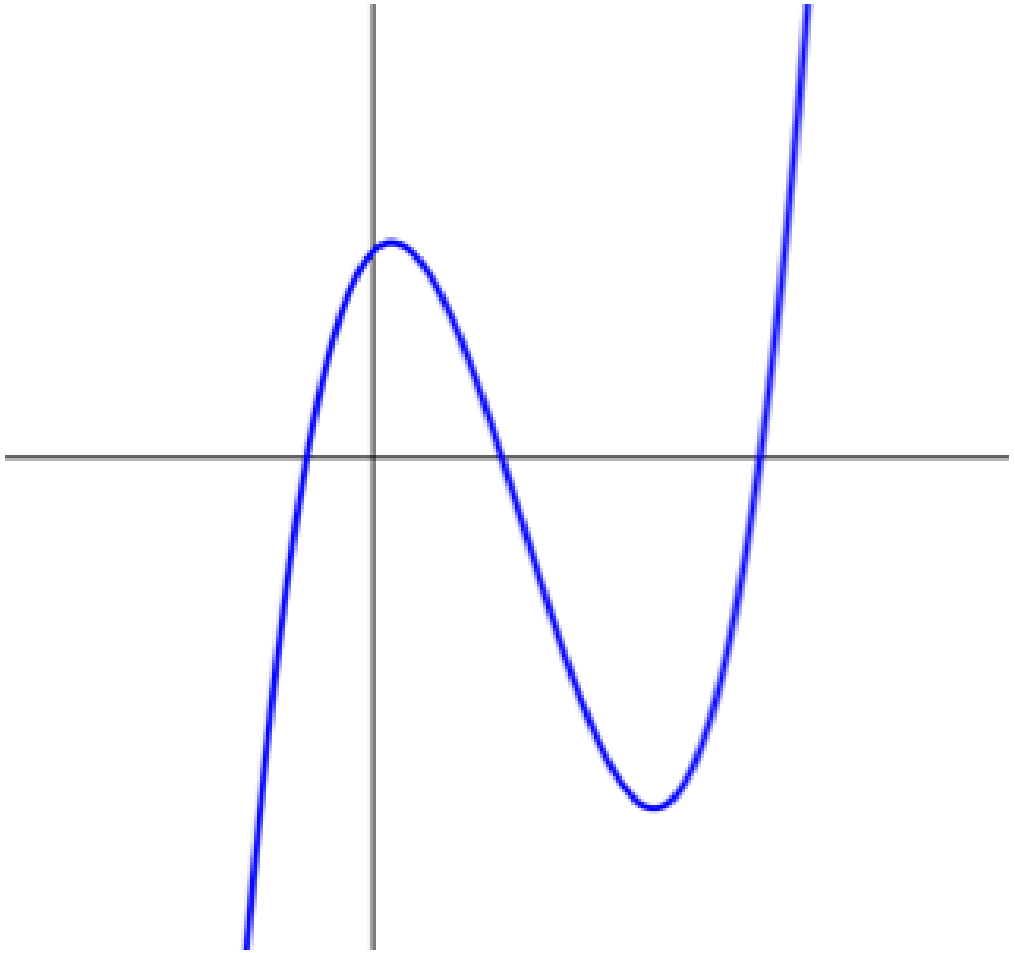
ex: Determine the value(s) of c guaranteed by the conclusion of the MVT on the given interval, if possible.

d) $f(x)=|x|, \quad [-2,2]$

THEOREM 3.3 Rolle's Theorem

Let f be continuous on the closed interval $[a, b]$ and differentiable on the open interval (a, b). If $f(a) = f(b)$, then there is at least one number c in (a, b) such that

The Graphical Interpretation of Rolle's Theorem.



ex: Determine the value(s) of c guaranteed by the conclusion of Rolle's Theorem on the given interval, if possible.

a) $f(x) = \cos\frac{x}{3}, \quad [0, 6\pi]$

ex: Determine the value(s) of c guaranteed by the conclusion of Rolle's Theorem on the given interval, if possible.

b) $f(x) = x, \quad [1,20]$

ex:

Let f be the function given by $f(x) = x^3 - 3x^2$. What are all values of c that satisfy the conclusion of the Mean Value Theorem of differential calculus on the closed interval $[0, 3]$?

(A) 0 only (B) 2 only (C) 3 only (D) 0 and 3 (E) 2 and 3

FR:

Let f be the function given by $f(x) = x^3 - 7x + 6$.

(a) Find the zeros of f.

(b) Write an equation of the line tangent to the graph of f at $x = -1$.

(c) Find the number c that satisfies the conclusion of the Mean Value Theorem for f on the closed interval $[1, 3]$.