Rolle's Theorem

p. 278 - 286 (4.3)

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(existence 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 exists at least one number c in (a, b) where $f'(x) = 0$.

If these conditions hold true, then there is <u>at least</u> 1 number between a & b so that the tangent line is horizontal.

Determine whether Rolle's Theorem can be applied. If so, find c. If not, tell why.

1. $f(x) = x^4 - 2x^2$ on [-2, 2].

f is cont.

f is diff.

$f(-2) = 8$

$f(2) = 8$

$f'(x) = 4x^3 - 4x = 0$

$4x(x^2 - 1) = 0$

$x = 0 \quad x = \pm 1$

**2. Let f be a function that is differentiable (continuous) on the interval (1, 10). If $f(2) = -5$, $f(5) = 5$, and $f(9) = -5$, which of the following must be true?

I. f has at least 2 zeros. IVT ✓

II. The graph of f has at least one horizontal tangent. ✓ Rolle's

III. For some c, $2 < c < 5$, $f(c) = 3$. IVT ✓

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