1. [–/2 Points] DETAILS SCALCET9 4.2.009.MI.

Verify that the function satisfies the three hypotheses of Rolle's theorem on the given interval. Then find all numbers *c* that satisfy the conclusion of Rolle's theorem. (Enter your answers as a comma-separated list.)

$$f(x) = 3x^2 - 6x + 2, \quad [-1, 3]$$

$c =$

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2. [–/2 Points] DETAILS SCALCET9 4.2.011.

Verify that the function satisfies the three hypotheses of Rolle's Theorem on the given interval. Then find all numbers *c* that satisfy the conclusion of Rolle's Theorem. (Enter your answers as a comma-separated list.)

$$f(x) = \sin\left(\frac{x}{2}\right), \quad \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$$

$c =$

3. [–/1 Points] DETAILS SCALCET9 4.XP.2.001.

Verify that the function satisfies the three hypotheses of Rolle's Theorem on the given interval. Then find all numbers *c* that satisfy the conclusion of Rolle's Theorem. (Enter your answers as a comma-separated list.)

$$f(x) = 5 - 40x + 4x^2, \quad [4, 6]$$

c =

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4. [–/2 Points] DETAILS SCALCET9 4.XP.2.004.

Does the function satisfy the hypotheses of the Mean Value Theorem on the given interval?

$$f(x) = 3x^2 + 5x + 8, \quad [-1, 1]$$

- Yes, f is continuous on $[-1, 1]$ and differentiable on $(-1, 1)$ since polynomials are continuous and differentiable on $\mathbb{R}$.
- Yes, it does not matter if f is continuous or differentiable; every function satisfies the Mean Value Theorem.
- No, f is not continuous on $[-1, 1]$.
- No, f is continuous on $[-1, 1]$ but not differentiable on $(-1, 1)$.
- There is not enough information to verify if this function satisfies the Mean Value Theorem.

If it satisfies the hypotheses, find all numbers *c* that satisfy the conclusion of the Mean Value Theorem. (Enter your answers as a comma-separated list. If it does not satisfy the hypotheses, enter DNE.)

c =

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5. [–/3 Points] DETAILS SCALCET9 4.2.AE.003.

Example 3

Video Example

To illustrate the Mean Value Theorem with a specific function, let's consider $f(x) = x^3 - x$, $a = 0$, $b = 6$. Since f is a polynomial, it is continuous and differentiable for all x, so it is certainly continuous on [0, 6] and differentiable on (0, 6). Therefore, by the Mean Value Theorem, there is a number c in (0, 6) such that

$$f(6) - f(0) = f'(c)(6 - 0).$$

Now $f(6) =$ ______ , $f(0) =$ ______ , and , $f'(x) =$ ______ so this equation becomes

$f'(c)(6) = \Big($ ______ $\Big)(6) =$ ______

______ = ,

which gives , $c^2 =$ ______ that is, . $c = \pm$ ______ But c must be in (0, 6), so $c =$ ______ .

The following figure illustrates the calculation that the tangent line at this value of c is parallel to the secant line.