1. (2 pts) Fill in the missing information for the following theorems.

Name of Theorem: 

Let $f$ be a function that satisfies the following hypotheses:

(1) $f$ is continuous on the closed interval $[a, b]$.
(2) $f$ is differentiable on the open interval $(a, b)$.
(3) 

Then there is a number $c$ in $(a, b)$ such that $f'(c) = 0$.

Name of Theorem: 

Let $f$ be a function that satisfies the following hypotheses:

(1) $f$ is continuous on the closed interval $[a, b]$.
(2) $f$ is differentiable on the open interval $(a, b)$.

Then there is a number $c$ in $(a, b)$ such that 

2. (2 points) Let $R$ be the finite region bounded by $y = 4 - x^2$ and the $x$-axis. Set up, but do not evaluate, a definite integral which represents the volume of the solid with base $R$ for which the cross-sections perpendicular to the $x$-axis are semi-circles.
3. (4 pts) Let \( R \) be the finite region bounded by \( y = 2 \ln x \), \( x = 3 \) and the \( x \)-axis. In the following manner set up, but do not evaluate, definite integrals which represent the volume of the solid obtained when \( R \) is revolved around the line \( y = -1 \).

(a) Integrate with respect to \( x \).

(b) Integrate with respect to \( y \). (Note: The integrands in parts (a) and (b) should be different.)

4. (2 pts) The number \( c \) guaranteed by the Mean Value Theorem for the function \( f(x) = \frac{1}{x} \) on \( [a, b] \) is the geometric mean of \( a \) and \( b \). Find the geometric mean of 2 and 5.
1. (2 pts) Fill in the missing information for the following theorems.

Name of Theorem: ________________________________
Let \( f \) be a function that satisfies the following hypotheses:

(1) \( f \) is continuous on the closed interval \([a, b]\).
(2) \( f \) is differentiable on the open interval \((a, b)\).

Then there is a number \( c \) in \((a, b)\) such that ________________________________ .

Name of Theorem: ________________________________
Let \( f \) be a function that satisfies the following hypotheses:

(1) \( f \) is continuous on the closed interval \([a, b]\).
(2) \( f \) is differentiable on the open interval \((a, b)\).
(3) ________________________________ .

Then there is a number \( c \) in \((a, b)\) such that \( f'(c) = 0 \).

2. (2 points) Let \( R \) be the finite region bounded by \( y = 9 - x^2 \) and the \( x \)-axis. Set up, but do not evaluate, a definite integral which represents the volume of the solid with base \( R \) for which the cross-sections perpendicular to the \( x \)-axis are squares.
3. (4 pts) Let \( R \) be the finite region bounded by \( y = \frac{1}{3} \ln x, \ x = 4 \) and the \( x \)-axis. In the following manner set up, but do not evaluate, definite integrals which represent the volume of the solid obtained when \( R \) is revolved around the line \( y = 5 \).

(a) Integrate with respect to \( y \).

(b) Integrate with respect to \( x \). (Note: The integrands in parts (a) and (b) should be different.)

4. (2 pts) The number \( c \) guaranteed by the Mean Value Theorem for the function \( f(x) = \frac{1}{x} \) on \([a, b]\) is the geometric mean of \( a \) and \( b \). Find the geometric mean of 3 and 7.