



The Mean Value Theorem

The definition of the Mean Value Theorem (MVT) appears on page 1.3. Study the theorem and its graphical representation.

On page 1.4, you will see the graph of $f_1(x) = x^2$. Grab and drag the point of tangency along the curve on the interval $(0, 1)$. Try to find a location where the slope of the tangent line is equal to the slope of the secant line.

1. Are the hypotheses of the MVT met? If so, then find the value of c guaranteed to exist by this theorem using page 1.5. If the hypotheses are not met, then state why.

The graph of $f_2(x) = \sin x$ is on page 1.6. Grab the point of tangency and drag the tangent line along the curve on the interval $(0, 2\pi)$. Try to find a location where the slope of the tangent line is equal to the slope of the secant line.

2. How many values of c are there? Does this violate the MVT?
3. If the hypotheses of the MVT are met, then find the value(s) of c guaranteed to exist by this theorem using the calculator section of page 1.7. If the hypotheses are not met, state why.

On page 1.8, you will make a graph of $f_3(x) = x^{\frac{2}{3}}$. Grab and drag the point of tangency along the curve on the interval $(-2, 2)$.

4. Is there a value of c that satisfies the MVT? If the hypotheses of the MVT are met, then find the value(s) of c guaranteed to exist by this theorem. If the hypotheses are not met, state why.

On page 1.9, you will make the graph of $f(x) = \frac{1}{x^2}$. Grab and drag the point of tangency along the curve on the interval $(-2, 2)$.

5. Is there a value of c that satisfies the MVT? If the hypotheses of the MVT are met, then find the value(s) of c guaranteed to exist by this theorem. If the hypotheses are not met, state why.

Extension – Application

The Mean Value Theorem can be applied to velocity. For example, if a car averages 60 mph on a road trip, then there must be at least one time during the trip where the instantaneous velocity (the measurement on the speedometer) is 60 mph.

6. Two race horses finish a race in a tie. Show that the two horses had the same velocity at least once during the race.