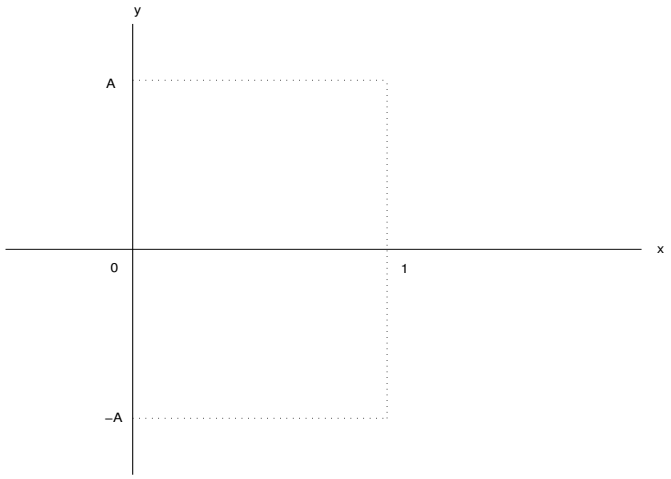
Extreme Value Theorem
Mean Value Theorem

1. Let f be a continuous function on the closed interval $0 \leq x \leq 1$. There exists a positive number A so that the graph of f can be drawn inside the rectangle $0 \leq x \leq 1$, $-A \leq y \leq A$.



The above statement is:

(a) Always true.

(b) Sometimes true.

(c) Not enough information.

2. On a toll road a driver takes a time stamped toll-card from the starting booth and drives directly to the end of the toll section. After paying the required toll, the driver is surprised to receive a speeding ticket along with the toll receipt. Which of the following best describes the situation?

(a) The booth attendant does not have enough information to prove that the driver was speeding.

(b) The booth attendant can prove that the driver was speeding during his trip.

(c) The driver will get a ticket for a lower speed than his actual maximum speed.

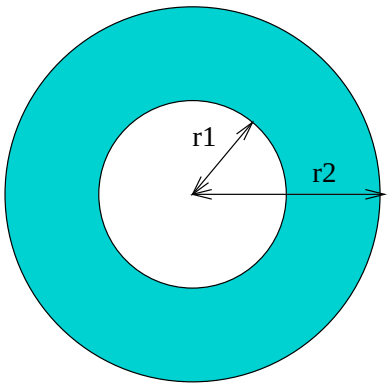
(d) Both (b) and (c).

Be prepared to justify your answer.

3. **True** or **False**. For $f(x) = |x|$ on the interval $[-\frac{1}{2}, 2]$, can you find a point c in $(-\frac{1}{2}, 2)$ such that

$$f'(c) = \frac{f(2) - f(-\frac{1}{2})}{2 - (-\frac{1}{2})}$$

4. The region between two concentric circles of radius r_1 and r_2 is called an annulus. If $r_2 > r_1$, the area of the annulus is $\pi(r_2^2 - r_1^2)$.



(a) This area can be approximated by a sum of areas of rectangles, but there is no single rectangle that has exactly the same area.

(b) This area cannot be approximated by the area of rectangles because the circles are concentric.

(c) There must be a radius, r, between r_1 and r_2 for which the rectangle with base $r_2 - r_1$ and height $2\pi r$ is exactly equal to the area of the annulus.