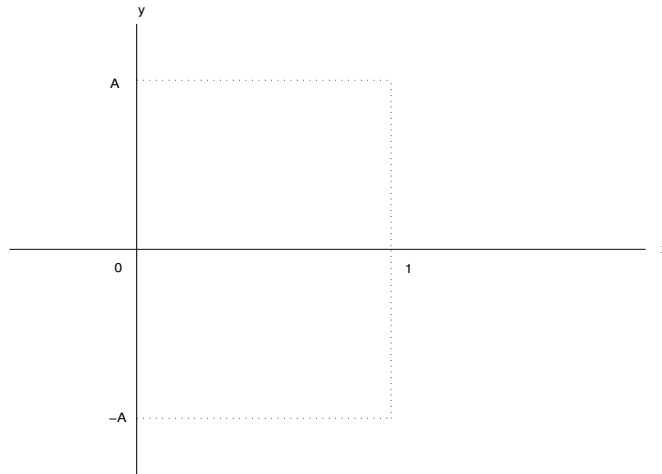


PRS Questions
November 16, 2004

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:

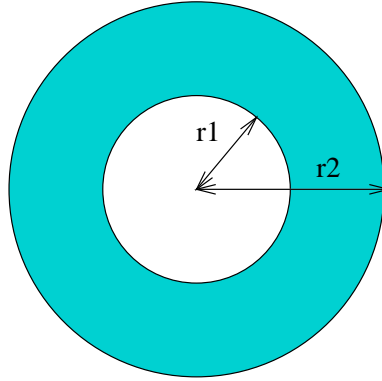
- (a) Always true.
 - (b) Sometimes true.
 - (c) Not enough information.
2. On a toll road a driver takes a time stamped toll-card from the starting booth and drives directly to the end of the toll section. After paying the required toll, the driver is surprised to receive a speeding ticket along with 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.