



# Calculus 1 Workbook

---

Intermediate Value Theorem

*krista king*  
MATH

## INTERMEDIATE VALUE THEOREM WITH AN INTERVAL

■ 1. The value  $c = -1$  satisfies the conditions of the Intermediate Value Theorem for the function on the interval  $[-3, 5]$  because  $f(c)$  equals what value?

$$f(x) = \frac{1}{4}(2x + 5)(x - 3)^2$$

■ 2. The value  $c = 2$  does not satisfy the conditions of the Intermediate Value Theorem for  $g(x) = 2x^2 - 11x + 4$  on the interval  $[-2, 4]$  because  $g(c)$  equals what value?

■ 3. What value of  $c$  is guaranteed by the Intermediate Value Theorem on the interval  $[-3, 3]$  if  $h(x) = 3(x + 1)^3$  and  $h(c) = 24$ ?

■ 4. What value of  $c$  is guaranteed by the Intermediate Value Theorem on the interval  $[-5, 6]$  if  $f(c) = -6$  and

$$f(x) = \begin{cases} 3x - 10 & \text{if } x \leq 0 \\ x^2 + 3x - 10 & \text{if } 0 < x < 2 \\ 3x - 6 & \text{if } x \geq 2 \end{cases}$$



- 5. Show that the function has a zero in the interval  $[2,9]$  and find the solution.

$$g(x) = \frac{x^2 - 9}{x + 3}$$

- 6. What value of  $c$  is guaranteed by the Intermediate Value Theorem on the interval  $[3,6]$  if  $c$  is a root of  $h(x)$ .

$$h(x) = \frac{x^3 - 4x^2 - 11x + 30}{x^2 - 4}$$



## INTERMEDIATE VALUE THEOREM WITHOUT AN INTERVAL

- 1. Use the Intermediate Value Theorem to prove that the equation  $2e^x = 3 \cos x$  has at least one positive solution. In what interval is that solution?
  
- 2. Use the Intermediate Value Theorem to prove that the equation  $3 \sin x + 7 = x^2 - 2x - 2$  has at least one positive solution. In what interval is that solution?
  
- 3. Use the Intermediate Value Theorem to prove that the equation  $x^6 - 9x^4 + 7 = x^5 - 8x^3 - 9$  has at least one positive solution. In what interval is that solution?
  
- 4. Use the Intermediate Value Theorem to prove that the equation  $4e^{x-3} = 2(x^3 - 5x + 9)$  has at least one negative solution. In what interval is that solution?
  
- 5. Use the Intermediate Value Theorem to show that the equation has at least one positive solution. In what interval is that solution?



$$6e^{-x} = -\left(\frac{1}{5}x^2 - 4x + 9\right)$$

- 6. Use the Intermediate Value Theorem to show that the equation  $2 \sin(4x - 1) = \cos(2x - 3)$  has at least one negative solution. In what interval is that solution?



