

Intermediate Value Theorem Applications

Check continuity on the closed interval, compare endpoint values with the target, and conclude only what the theorem guarantees.

1. The endpoints of $f(x)=x^2+15$ on $[-1,1]$ are both 16. Can IVT guarantee a point with $f(c)=17$?

2. Let $f(x)=x+12$ for $x\leq 1$ and $2x+11$ for $x>1$. Use IVT on $[0,2]$ for target 13.

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Check continuity on the closed interval, compare endpoint values with the target, and conclude only what the theorem guarantees.

3. For $f(x)=1/(x-16)$, can IVT on $[15,17]$ guarantee $f(c)=0$?

4. For $f(x)=1/(x+10)$, use IVT on $[0,1]$ for target 0.0955.

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5. Let $f(x)=x$ for $x<0$ and $x+20$ for $x\geq 0$. Can IVT on $[-1,1]$ guarantee $f(c)=0$?

6. For $f(x)=x^2+13$, use IVT on $[0,3]$ to decide whether $f(c)=15$ is guaranteed.

Math Sheet

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Intermediate Value Theorem Applications

Worked Answer Key

Check continuity on the closed interval, compare endpoint values with the target, and conclude only what the theorem guarantees.

1. The endpoints of $f(x)=x^2+15$ on $[-1,1]$ are both 16. Can IVT guarantee a point with $f(c)=17$?

Answer: No guarantee: the target is not bracketed, so IVT is inconclusive about existence.

1. The polynomial is continuous.
2. Both endpoint values equal 16, so 17 is not bracketed.
3. The IVT hypotheses for this target are not met.

2. Let $f(x)=x+12$ for $x \leq 1$ and $2x+11$ for $x > 1$. Use IVT on $[0,2]$ for target 13.

Answer: Guaranteed; the pieces meet at $x=1$ and the target is bracketed.

1. Both pieces are continuous and equal 13 at $x=1$.
2. $f(0)=12$, $f(2)=15$; the target is between them.
3. IVT applies on $[0,2]$.

Intermediate Value Theorem Applications

Worked Answer Key

Check continuity on the closed interval, compare endpoint values with the target, and conclude only what the theorem guarantees.

3. For $f(x)=1/(x-16)$, can IVT on $[15,17]$ guarantee $f(c)=0$?

Answer: No guarantee: f is discontinuous at $x=16$; IVT is inconclusive about existence.

- 1. The denominator is zero at $x=16$, inside the interval.
- 2. Continuity on the whole closed interval fails.
- 3. IVT is inconclusive; do not infer nonexistence from that failure.

4. For $f(x)=1/(x+10)$, use IVT on $[0,1]$ for target 0.0955.

Answer: Guaranteed for at least one c in $(0,1)$.

- 1. $x+10$ is nonzero on $[0,1]$, so f is continuous.
- 2. The target lies strictly between $f(0)$ and $f(1)$.
- 3. IVT guarantees a solution.

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Intermediate Value Theorem Applications

Worked Answer Key

Check continuity on the closed interval, compare endpoint values with the target, and conclude only what the theorem guarantees.

5. Let $f(x)=x$ for $x<0$ and $x+20$ for $x\geq 0$. Can IVT on $[-1,1]$ guarantee $f(c)=0$?

Answer: No guarantee from IVT because the function jumps at $x=0$; no claim of nonexistence follows.

1. The one-sided values at 0 do not agree.
2. The function is not continuous on $[-1,1]$.
3. Therefore IVT gives no guarantee.

6. For $f(x)=x^2+13$, use IVT on $[0,3]$ to decide whether $f(c)=15$ is guaranteed.

Answer: Guaranteed for at least one c in the interval.

1. Polynomials are continuous on every closed interval.
2. $f(0)=13$ and $f(3)=22$; 15 lies between them.
3. IVT guarantees at least one c ; uniqueness is not claimed.