

Lesson 3.1 · Practice

No calculator required | Name: _____

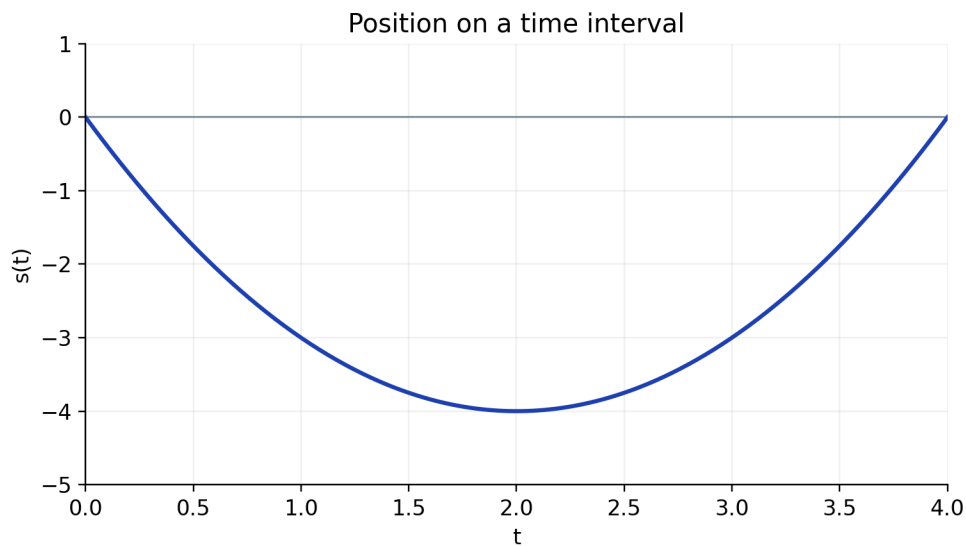
1. A sphere has $V = \frac{4}{3}\pi r^3$. If $r = 2$ cm and $\frac{dr}{dt} = 3$ cm/s, find $\frac{dV}{dt}$.

2. A 5 m ladder has base distance $x = 3$ m increasing at $\frac{dx}{dt} = 2$ m/s. Find the height rate.

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3. For $s(t) = t^2 - 4t$ on $[0, 4]$, describe direction and speed changes.



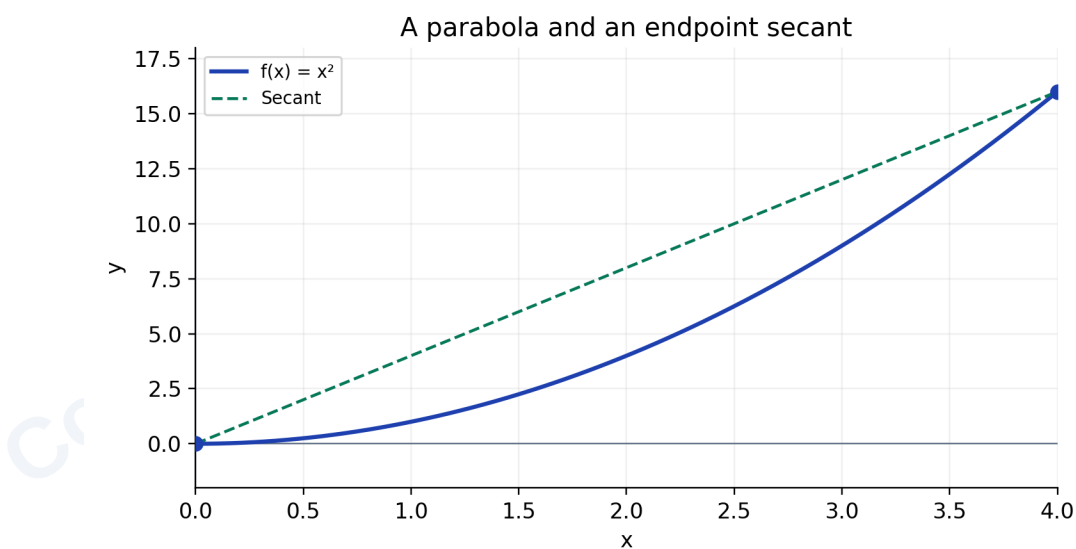
Use the position slopes to determine direction.

Lesson 3.2 · Practice

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4. Find absolute extrema of $f(x) = x^3 - 3x$ on $[-2, 2]$.

5. Find the MVT input for $f(x) = x^2$ on $[0, 4]$ and check its hypotheses.



Find a tangent parallel to the secant.

Lesson 3.2 · Practice

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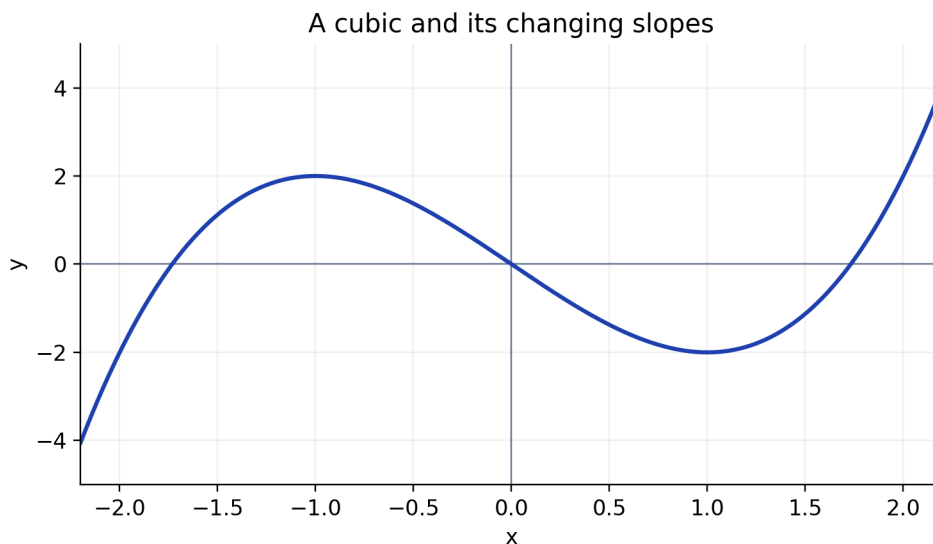
6. Can MVT be applied to $f(x) = |x|$ on $[-1, 1]$?

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Lesson 3.3 · Practice

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7. Analyze direction and concavity for $f(x) = x^3 - 3x$. Locate local extrema and the inflection point.



Use derivatives to justify the turns and concavity.

8. If f' is positive and decreasing on an interval, describe f .

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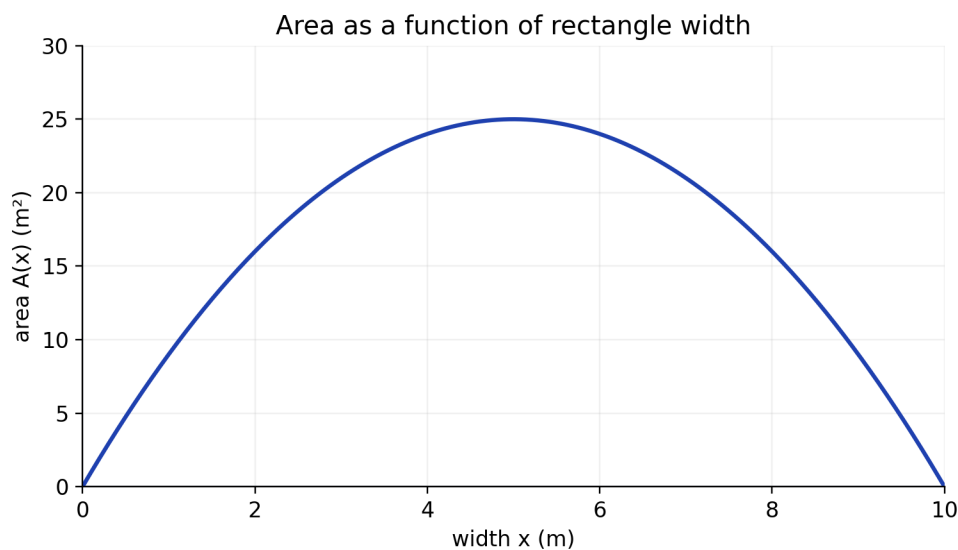
9. Does $f''(0) = 0$ prove an inflection point? Use $f(x) = x^4$.

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Lesson 3.4 · Practice

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10. A rectangle has perimeter 20 m. Find the maximum area and justify it.



Use the derivative to locate the maximum area.

11. Minimize $C(x) = x + 9/x$ on $x > 0$.

Lesson 3.4 · Practice

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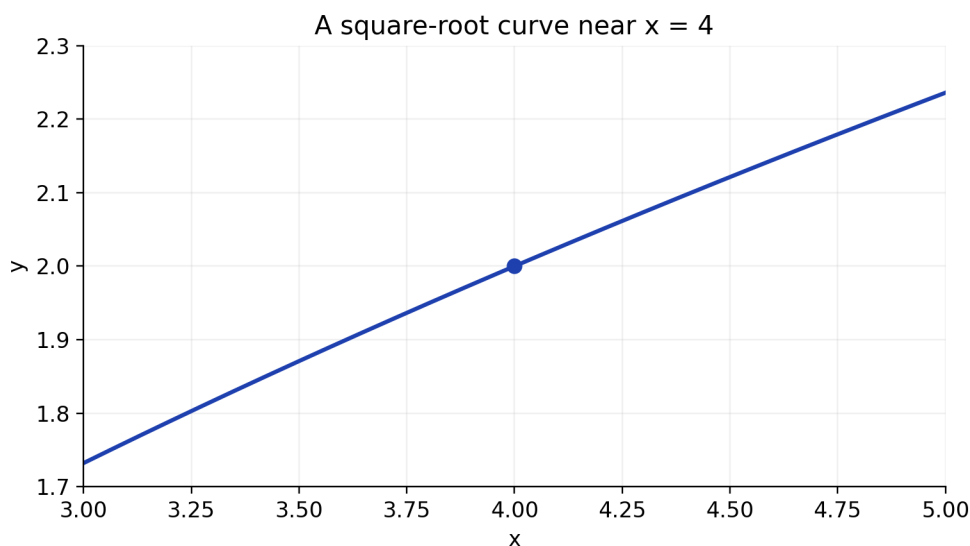
12. Find the point on $y = x^2$ closest to $(0, 1/2)$.

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Lesson 3.5 · Practice

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13. Use the tangent at 4 to estimate $\sqrt{4.2}$. Is it above or below the actual value?



Find a tangent-line estimate near the marked input.

14. Evaluate $\lim_{x \rightarrow 0} \frac{\ln(1+x)}{x}$. State the initial form.

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15. Can L'Hôpital's Rule evaluate $\lim_{x \rightarrow 1} \frac{x^2 + 1}{x + 1}$ by replacing numerator and denominator with derivatives?

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