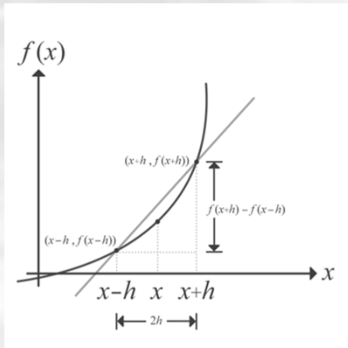
Differentiation

Audience Response Questions



http://nm.mathforcollege.com

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Appropriate scheme

You are given the time-velocity data for a body

Time, t (s)	0	1	6	8	11	15
Velocity (m/s)	1	8	15	18	22	29

Which one is the most appropriate scheme to use based on order of accuracy and data availability to calculate acceleration in $\frac{m}{s^2}$ at $8s$?

- Forward Divided Difference Method
- Central Divided Difference Method
- Backward Divided Difference Method

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A possible formula for approximating the second derivative of a function $f(x)$ is

- $\dfrac{f(x+h)-f(x-h)}{2h}$
- $\dfrac{f(x+h)-2f(x)+f(x-h)}{h^2}$
- $\dfrac{f(x+h)-2f(x)+f(x-h)}{h}$
- $\lim\limits_{h\to 0}\dfrac{f(x+h)-2f(x)+f(x-h)}{h^2}$

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The order of accuracy of the central divided difference approximation

$$f'(x) \approx \frac{f(x+h)-f(x-h)}{2h}$$

- $O(h)$
- $O(h^2)$
- $O(h^3)$

Total Results: 0

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The highest order of polynomial for which the central divided difference gives the exact answer for its first derivative at any point is

- 0
- 1
- 2
- 3

Total Results: 0

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Velocity vs Time

The velocity vs time data is given below.

t (s)	0	0.5	1.2	1.5	1.8
v (m/s)	0	213	223	275	300

The data points at t=1.2, 1.5 and 1.8 are interpolated to a 2nd order polynomial to give
$v(t) = -150t^2 + 578.33t - 255, 1.2 \le t \le 1.8$
The best estimate of acceleration at t=1.5 in m/s^2 using the polynomial is

- 83.33
- 128.33
- 173.33
- 275.00

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Using central divided difference, the true error in the calculation of a derivative of a function is 32.0 for a step size of 0.4. If the step size is reduced to 0.1, the true error will be approximately

- 2.0
- 4.0
- 8.0
- 16.0

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