

Derivative Approximation Worksheet - Answer Key

1. Use the slope of the secant line between $x = -2$ and $x = -1$ to approximate $f'(-1.5)$, where $f(x) = x^3 + 3x$.
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2. Lisa was 5 miles away from Shmoop at 9am and 3 miles away at 8:15am. Find her average rate of travel.
 $\frac{2}{0.25} = 8\text{miles/hr}$

3. Find the derivative of $f(x) = 2x^2$ using the limit definition.
 $\lim_{h \rightarrow 0} \frac{2(x+h)^2 - 2x^2}{h} = \lim_{h \rightarrow 0} \frac{2h(2x+h)}{h} = 4x$

4. Use the following table to approximate $f'(0)$:

x	-0.5	-0.3	-0.1	0.08	0.1
$f(x)$	34.6	27	28.1	26	24.3

$$\frac{d(0.08) - d(-0.1)}{0.08 - (-0.1)} = \frac{26 - 28.1}{0.18} = -11.67$$

5. Find the derivative of $f(x) = \frac{1}{x}$ at $x = -1$ using the limit definition.
 $\lim_{h \rightarrow 0} \frac{\frac{1}{-1+h} - \frac{1}{-1}}{h} = \lim_{h \rightarrow 0} \frac{\frac{-h}{-1+h}}{h} = 1.$
6. If x is measured in minutes and y is measured in slices of pizza then find the

units of $\left. \frac{dy}{dx} \right|_{y=5}.$

Slices of pizza per minute

7. Fill the following table to approximate $f'(1)$ for $f(x) = e^{-x}$:

h	-0.1	-0.01	0	0.05	0.1
$f(1+h)$	0.41	0.37158	0.3679	0.35	0.33

$$\frac{f(1) - f(0.99)}{0.01} = -0.368$$

8. Use the slope of the secant line to approximate the derivative of $g(x) = 2^x - 1$ at $x = 1$.
 $\frac{f(1.001) - f(1)}{0.001} = 1.387$

9. Stan's distance(in miles) from home is given by $d(t) = 2t^2 + t$, where $t = 0$ denotes the time he starts his running. Find his instantaneous speed after 15 mins.

$$\frac{d(0.25+0.01) - d(0.25-0.01)}{0.02} = 0.04\text{miles/hr.}$$

10. If x is measured in hours and y is measured in area of wall painted (m^2) then interpret $\left. \frac{dy}{dx} \right|_{y=2} = 8.3$.
Rate at which the wall is painted after 2 hours is $8.3 \text{ m}^2/\text{hr.}$

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