Derivatives Practice

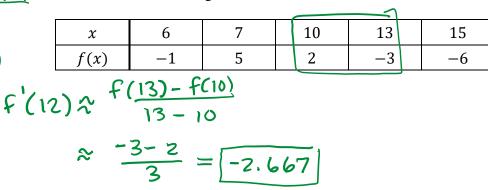
Understanding Derivatives

1) Given $\lim_{h \to 0} \frac{2(-1+h)^3 + 4 - (2(-1)^3 + 4)}{h}$ as an expression for the derivative of f(x) at x = c, identify the function f(x) and the value of c. definition of derivative $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $f(-1) = 2(-1)^3 + 4$ where -1 $f'(-1) = \lim_{h \to 0} \frac{f(-1+h) - f(-1)}{h}$ $f(x) = 2x^3 + 4$ $f(x) = 2x^3 + 4$ and C = -12) Given $\lim_{x \to 4} \frac{\ln(3x-2) - \ln 10}{x-4}$ as an expression for the derivative of g(x) at x = c, identify the function g(x) and the value of c. a Hernate form of the derivative $f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$ where $f'(y) = \lim_{x \to y} \frac{f(x) - f(y)}{x - y} = \ln(3x - 2)$ $a^{2}y + f'(y) = x - y + \frac{1}{x - y} = \ln(3 - 2)$ - On 10 ..., f(x) = ln(3x-2) and c = 4

3) An equation for the line tangent to the graph of the function f at x = -2 is $y + 4 = \frac{1}{5}(x + 2)$. What is f'(-2)? Y = Y_1 = m(x - x_1) Y = Y_2 = m(x - x_1) S = -2 f'(-z) = f'(-z) = f'(-z) = f'(-z) = f'(-z) = f'(-z)

Derivatives Numerically

4) The table below gives select values for the differentiable function f, find the best estimate for f'(12) that can be made from the given table.



Derivatives using TI-Nspire

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Using your graphing calculator (remember answers need to be with 3 decimal places), given:

5)
$$f(x) = x^2 e^{\cos x}$$
, find $f'(2)$.
 $f'(z) = 0.239$
 $\frac{d}{dx} (x^2 \cdot e^{\cos(x)})|_{x=2}$
0.239304

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Derivatives Analytically (Algebraically)

6) Using the definition of the derivative, find the derivative of the function $f(x) = x^2 + 3x - 4$.

$$f'(x) = \lim_{h \to 0} \frac{(x+h)^{2} + 3(x+h) - 4 - (x^{2} + 3x - 4)}{h}$$

=
$$\lim_{h \to 0} \frac{x^{2} + 2xh + h^{2} + 3xt - 4 - x^{2} - 3x + 44}{h}$$

=
$$\lim_{h \to 0} \frac{2xh + h^{2} + 3h}{h}$$

=
$$\lim_{h \to 0} \frac{1}{h} \frac{(2x + h + 3)}{h}$$

=
$$\lim_{h \to 0} \frac{1}{h} \frac{(2x + h + 3)}{h}$$

(2x + h + 3)
(f'(x) = 2x + 3)

7) Using the definition of the derivative, find the g'(3) where $g(x) = \frac{1}{x}$.

$$g'(3) = \lim_{h \to 0} \frac{q(3+h) - q(3)}{h}$$

$$= \lim_{h \to 0} \frac{3}{3+h} - \frac{1}{3}$$

$$= \lim_{h \to 0} \frac{3}{3} \cdot \frac{1}{3+h} - \frac{1}{3} \cdot \frac{3+h}{3+h}$$

$$= \lim_{h \to 0} \frac{3 - (3+h)}{h}$$

$$= \lim_{h \to 0} \frac{3 - (3+h)}{3(3+h)} \cdot \frac{1}{h}$$

$$= \lim_{h \to 0} \frac{-1}{3(3+h)} \cdot \frac{1}{h}$$

$$= \lim_{h \to 0} \frac{-1}{3(3+h)}$$

$$= \lim_{h \to 0} \frac{-1}{3(3+h)}$$
8) Using the alternate form of the derivative, find slope of the tangent line to $h(x) = \sqrt{x}$ at $x = 4$.

$$h^{1}(4) = \lim_{X \to 4} \frac{\sqrt{x} - \sqrt{4}}{x - 4}$$

$$= \lim_{X \to 4} \frac{\sqrt{x} - 2}{x - 4} \cdot \frac{\sqrt{x} + 2}{\sqrt{x} + 2} \qquad \text{multiply by}$$

$$= \lim_{X \to 4} \frac{x - 4}{x - 4} \cdot \frac{\sqrt{x} + 2}{\sqrt{x} + 2} \qquad \text{the conjugate}$$

$$= \lim_{X \to 4} \frac{1}{\sqrt{x} + 2}$$

$$= \lim_{X \to 4} \frac{1}{\sqrt{x} + 2}$$

$$= \frac{1}{\sqrt{4} + 2}$$

$$= \frac{1}{2 + 2}$$