Key

Quiz Review

Please do on separate paper.

Use Limit Definition of Derivatives to find the derivative for #1-4.

1. $f(x) = 3x + 7$

   $\boxed{f'(x) = 3}$

2. $g(x) = x^2 - 3x - 10$

   $\boxed{g'(x) = 2x - 3}$

3. $h(x) = \sqrt{4x-3}$

   $h'(x) = \dfrac{4}{2\sqrt{4x-3}} = \boxed{\dfrac{2}{\sqrt{4x-3}}}$

4. $f(x) = \dfrac{2}{x-6}$

   $f'(x) = \boxed{\dfrac{-2}{(x-6)^2}}$

Find the equation of the tangent line to at x=4 for #5-6. Write the line in slope intercept form.

5. $f(x) = 3x^3 - 4x + 2x^2$ $\boxed{y = 156x - 416}$

6. $g(x) = -\dfrac{x^4}{2} - 8\sqrt{x}$ $\boxed{y = -130x + 376}$

Find the derivative of the function at x = -2 for #7.

7. $h(x) = \dfrac{-3}{x^2} - \dfrac{4}{x^4} + 3x^{\frac{5}{3}}$ $\boxed{m \approx 6.69}$

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Quiz Review ~ Unit 7

① $f(x) = 3x + 7$

$$\lim_{h \to 0} \frac{3(x+h)+7 - (3x+7)}{h} = \frac{\cancel{3x} + 3h + \cancel{7} - \cancel{3x} - \cancel{7}}{h}$$

$$\lim_{h \to 0} \frac{3\cancel{h}}{\cancel{h}} = 3$$

$$\boxed{f'(x) = 3}$$

② $g(x) = x^2 - 3x - 10$

$$\lim_{h \to 0} \frac{(x+h)^2 - 3(x+h) - 10 - (x^2 - 3x - 10)}{h}$$

$$\lim_{h \to 0} \frac{\cancel{x^2} + 2hx + h^2 - \cancel{3x} - 3h - \cancel{10} - \cancel{x^2} + \cancel{3x} + \cancel{10}}{h}$$

$$\lim_{h \to 0} \frac{2hx + h^2 - 3h}{h}$$ ← simplify h

$$\lim_{h \to 0} 2x + h - 3$$

$$\boxed{g'(x) = 2x - 3}$$

(3) $h(x) = \sqrt{4x-3}$

$$\lim_{h \to 0} \frac{\sqrt{4(x+h)-3} - \sqrt{4x-3}}{h} \cdot \frac{(\sqrt{4(x+h)-3} + \sqrt{4x-3})}{\sqrt{4(x+h)-3} + \sqrt{4x-3})}$$

$$\lim_{h \to 0} \frac{(4(x+h)-3) - (4x-3)}{h(\sqrt{4(x+h)-3} + \sqrt{4x-3})}$$

$$\lim_{h \to 0} \frac{\cancel{4x} + 4h \cancel{-3} - \cancel{4x} + \cancel{3}}{h(\sqrt{4(x+h)-3} + \sqrt{4x-3})}$$

$$\lim_{h \to 0} \frac{4\cancel{h}}{\cancel{h}(\sqrt{4(x+h)-3} + \sqrt{4x-3}}$$

$$\lim_{h \to 0} \frac{4}{\sqrt{4(x+\cancel{h})-3} + \sqrt{4x-3}}$$

$$= \frac{4}{\sqrt{4x-3} + \sqrt{4x-3}}$$

$$\boxed{h'(x) = \frac{4}{2\sqrt{4x-3}}}$$

(4) $f(x) = \dfrac{2}{x-6}$

$$\lim_{h \to 0} \frac{\dfrac{2}{x+h-6} - \dfrac{2}{x-6}}{h}$$

$$\lim_{h \to 0} \frac{2(x-6) - 2(x+h-6)}{(x+h-6)(x-6)} \cdot \frac{1}{h}$$

$$\lim_{h \to 0} \frac{\cancel{2x} - \cancel{12} - \cancel{2x} - 2h + \cancel{12}}{(x+h-6)(x-6)h}$$

$$\lim_{h \to 0} \frac{-2\cancel{h}}{(x+h-6)(x-6)\cancel{h}}$$

$$\lim_{h \to 0} \frac{-2}{(x+\cancel{h}-6)(x-6)}$$

$$f'(x) = \frac{-2}{(x-6)(x-6)} = \boxed{\frac{-2}{(x-6)^2}}$$

(5) Find equation of tangent line to $x = 4$

$f(x) = 3x^3 - 4x + 2x^2$

$f'(x) = 9x^2 - 4 + 4x$

$f'(4) = 9(4)^2 - 4 + 4(4)$

$\boxed{m = 156}$

$f(4) = 3(4)^3 - 4(4) + 2(4)^2$

$= 208$ $\boxed{\text{point } (\underset{x}{4}, \underset{y}{208})}$

$y - y_1 = m(x - x_1)$

$y - 208 = 156(x - 4)$

$y - 208 = 156x - 624$

$\boxed{y = 156x - 416}$

(6) $g(x) = \dfrac{-x^4}{2} - 8\sqrt{x}$

$= -\frac{1}{2}x^4 - 8x^{1/2}$

$g'(x) = -2x^3 - 4x^{-1/2}$

$g'(4) = -2(4)^3 - 4(4)^{-1/2}$

$\boxed{m = -130}$

$g(4) = -\dfrac{(4)^4}{2} - 8\sqrt{4}$

$= -128 - 16$

$= -144$ point $(4, 144)$

$y + 144 = -130(x - 4)$

$y + 144 = -130x + 520$

$\boxed{y = -130x + 376}$

(7) $h(x) = \dfrac{-3}{x^2} - \dfrac{4}{x^4} + 3x^{5/3}$

$h(x) = -3x^{-2} - 4x^{-4} + 3x^{5/3}$

$h'(x) = 6x^{-3} + 16x^{-5} + 5x^{2/3}$

$h'(-2) = 6(-2)^{-3} + 16(-2)^{-5} + 5(-2)^{2/3}$

$\boxed{m \approx 6.69}$