

Use your power to write your name: \_\_\_\_\_ Period: \_\_\_\_\_

### AP Calculus AB: 3.4 Advanced Power Rule

Find the instantaneous rate of change of the following functions

1)  $f(x) = 7x^2 - 15x + 4$

$$f'(x) = 14x - 15$$

2)  $f(x) = 2\sqrt[3]{x^5} = 2x^{5/3}$

$$f'(x) = \frac{10\sqrt[3]{x^2}}{3}$$

3)  $g(x) = \frac{3}{4x^2} + x$

$$g'(x) = \frac{-3}{2x^3} + 1$$

4)  $f(x) = \frac{5x^3}{\sqrt{x}} - 12 = \frac{5x^3}{x^{1/2}} - 12 = 5x^{5/2} - 12$

$$f'(x) = \frac{25x^{3/2}}{2} = \frac{25\sqrt{x^3}}{2}$$

5)  $f(x) = \sqrt{x^3} - \sqrt{x} + 5$

$$f'(x) = \frac{3\sqrt{x}}{2} - \frac{1}{2\sqrt{x}}$$

6)  $f(x) = \frac{7}{(2x^2)^3} - x + 2$

$$f'(x) = \frac{-21}{4x^7} - 1$$

7)  $f(x) = (2x + 5)^2 = 4x^2 + 20x + 25$

$$f'(x) = 8x + 20$$

8)  $f(x) = 2\sqrt{x}(3x - \frac{1}{x}) = 6x^{3/2} - 2x^{-1/2}$

$$f'(x) = 9\sqrt{x} + \frac{1}{\sqrt{x^3}}$$

9) Evaluate the limit:  $\lim_{h \rightarrow 0} \frac{(x+h)^2 - 7(x+h) + 2 - (x^2 - 7x + 2)}{h} \leftarrow f(x)$

definition of a derivative  $\boxed{2x - 7}$

10) Evaluate the instantaneous rate of change of  $f(x) = \sqrt[3]{x^2} + \frac{2x}{3} - 7$  at  $x = 8$ .

$$f'(x) = \frac{2}{3\sqrt[3]{x}} + \frac{2}{3}$$

$$f'(8) = \frac{2}{3\sqrt[3]{8}} + \frac{2}{3} = \frac{2}{6} + \frac{2}{3} = \frac{2}{6} + \frac{4}{6} = \frac{6}{6} = \boxed{1}$$