

WARMUP

Find $f'(x)$

$$f(x) = x^3 \cdot e^x$$

$$f'(x) = \underbrace{x^3 \cdot e^x} + \underbrace{e^x \cdot 3x^2}$$
$$= x^2 e^x (x + 3)$$

$$f(x) = \frac{7x-3}{6x+1}$$

$$f'(x) = \frac{(6x+1)7 - (7x-3)6}{(6x+1)^2}$$

$$f'(x) = \frac{\cancel{42x} + 7 - \cancel{42x} + 18}{(6x+1)^2}$$

$$f'(x) = \frac{25}{(6x+1)^2}$$

ex: $f(x) = x^4 \cdot 3^x$

$$f'(x) = \underbrace{x^4}_{1st} \cdot \underbrace{3^x}_{2nd} \cdot \ln 3 + \underbrace{3^x}_{2nd} \cdot \underbrace{4x^3}_{1st}$$

$$f'(x) = x^3 \cdot 3^x (x \cdot \ln 3 + 4)$$

ex: $g(x) = \frac{5-3x}{10-7x}$

$$g'(x) = \frac{(10-7x)(-3) - (5-3x)(-7)}{(10-7x)^2}$$

$$g'(x) = \frac{-30 + \cancel{21x} + 35 - \cancel{21x}}{(10-7x)^2}$$

$$g'(x) = \frac{5}{(10-7x)^2}$$

$$1) f'(x) = 72x^3 - 9x^2 + 2$$

$$2) f'(x) = -\frac{5}{x^2} - \frac{14}{x^3}$$

aren't simplified enough

$$\frac{2\frac{1}{2}}{x^{\frac{1}{2}}} = \frac{2.5}{x^{\frac{1}{2}}}$$

$$3) f'(x) = 6x^{\frac{1}{2}} - \frac{5}{2x^{\frac{1}{2}}} = 6\sqrt{x} - \frac{5}{2\sqrt{x}}$$

$$4) f'(x) = 1 - \frac{1}{x^2}$$

$$\frac{1}{3} + \frac{7}{3} = \frac{1+7}{3}$$

$$5) f(x) = \frac{5x^4}{x^2} - \frac{7x^3}{x^2} + \frac{10x^2}{x^2}$$

$$= 5x^2 - 7x + 10$$

$$5) f'(x) = 10x - 7$$

$$f'(x) = 10x - 7$$

$$6) f'(x) = \frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{x^3}}$$

$$f(x) = \frac{x^1}{x^{\frac{1}{2}}} - \frac{1}{x^{\frac{1}{2}}}$$

$$= x^{\frac{1}{2}} - x^{-\frac{1}{2}}$$

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

$$= \frac{1}{2x^{\frac{1}{2}}} + \frac{1}{2x^{\frac{3}{2}}}$$

$$7) f'(x) = \frac{49}{2}\sqrt{x^5} = \frac{49\sqrt{x^5}}{2}$$

$$7 \cdot x^{\frac{14}{4}} = 7x^{\frac{7}{2}}$$

$$f'(x) = \frac{49}{2}x^{\frac{5}{2}} = \frac{49}{2}\sqrt{x^5}$$

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

$$f(x) = 3x^2 + 12x^{-\frac{1}{2}} - x^{-2}$$

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

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

$$9) y = -21x - 28$$

slope

$$f(x) = 7x^{-3}$$

$$f'(x) = -21x^{-4}$$

$$= \frac{-21}{x^4}$$

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

$$\text{POINT: } (-1, f(-1)) = (-1, -7)$$

$$f(-1) = \frac{7}{(-1)^3} = \frac{7}{-1} = -7$$

$$\text{EQ: } -7 = -21(-1) + b$$

$$-7 = 21 + b$$

$$-28 = b$$

$$y = -21x - 28$$

$$10) f'(4) = \frac{a \cdot n \cdot 4^{n-1}}{1} = 24$$

$$f'(2) = \frac{a \cdot n \cdot 2^{n-1}}{1} = 3$$

$$\left(\frac{4}{2}\right)^{n-1} = 8$$

$$2^{n-1} = 2^3$$

$$n-1 = 3$$

$$n = 4$$

$$a \cdot 4 \cdot 2^{4-1} = 3$$

$$a \cdot 4 \cdot 2^3 = 3$$

$$a \cdot 32 = 3$$

$$a = \frac{3}{32}$$

BONUS: $f'(x) = 324x^3 - 648x^2 + 432x - 96$