POWER RULE - PRODUCT - QUOTIENT - CHAIN

DAY 46

The RULES.

Pp 180-182 #3, 14, 29, 41, 43, 65, 72, 79, 80, 95 (a-d)

(3) $z = \dfrac{t^2+3t+1}{t+1}$ MUST USE QUOTIENT RULE b/c you cannot rewrite.

$$\frac{dz}{dt} = \frac{(t+1)(2t+3) - (t^2+3t+1)(1)}{(t+1)^2}$$ SIMPLIFY

$$= \frac{(2t^2+5t+3) - (t^2+3t+1)}{(t+1)^2} = \frac{t^2+2t+2}{(t+1)^2}$$

(14) $y = e^{-\pi} + \pi^{-e}$ ← both are constants

$$\frac{dy}{dx} = 0$$

(29) $r(\theta) = e^{(e^\theta + e^{-\theta})}$

$\dfrac{d(e^\theta)}{d\theta} = e^\theta$ $\dfrac{d}{d\theta}\left(e^{\text{mess}}\right) = e^{\text{mess}} \cdot \dfrac{d(\text{mess})}{d\theta}$

$$r'(\theta) = e^{(e^\theta + e^{-\theta})} \cdot (e^\theta - e^{-\theta})$$

(41) $H(t) = (at^2+b)(e^{-ct})$ PRODUCT RULE with respect to variable $\boxed{t}$ all other "letters" are constants

$$H'(t) = (2at)(e^{-ct}) + (at^2+b)(-c\cdot e^{-ct})$$ SIMPLIFY

$$H'(t) = e^{-ct}\left(2at + (at^2+b)(-c)\right)$$

$$H'(t) = e^{-ct}\left(-act^2 + 2at - bc\right)$$

(43) $y = 5^x + 2$ exponential rule

$$\frac{dy}{dx} = (\ln 5)\cdot 5^x$$

(65) $z = (s^2 - \sqrt{5})(s^2 + \sqrt{5})$ REWRITE! these are conjugate factors so you know the product...

$$z = s^4 - 5$$

$$(a-b)(a+b) = a^2 - b^2$$

$$\frac{dz}{ds} = 4s^3 - 1$$

* DON'T USE PRODUCT RULE.

DAY 46 (continued) pp. 180–182 # 72, 79, 80, 95 (a–d)

$d\left(\frac{1}{x}\right) = \frac{-1}{x^2}$

$d\left(\frac{-1}{x^2}\right) = \frac{2}{x^3}$

72 $h(x) = \left(\frac{1}{x} - \frac{1}{x^2}\right)(2x^3+4)$

★ $h'(x) = \left(-\frac{1}{x^2} + \frac{2}{x^3}\right)(2x^3+4) + \left(\frac{1}{x} - \frac{1}{x^2}\right)(6x^2)$

$h'(x) = \left(\frac{-x+2}{x^3}\right)(2x^3+4) + \left(\frac{x-1}{x^2}\right)(6x^2)$

$h'(x) = \left(\frac{1}{x^3}\right)\left[(-x+2)(2x^3+4) + (x)(x-1)(6x^2)\right]$

$-2x^4 + 4x^3 - 4x + 8 + 6x^4 - 6x^3$

$(4x^4 - 2x^3 - 4x + 8)$

$h'(x) = \frac{(4x^4 - 2x^3 - 4x + 8)}{x^3}$

I wanted to see where this went so I simplified

79 $f(t) = 2t^3 - 4t^2 + 3t - 1$

$f'(t) = 6t^2 - 8t + 3$

$f''(t) = 12t - 8$

80 $f(x) = 13 - 8x + \sqrt{2}x^2$

$f'(x) = -8 + 2\sqrt{2}\,x$

$f'(r) = -8 + 2\sqrt{2}(r) = 4$

$2\sqrt{2}\,r = 12$

$r = \frac{6}{\sqrt{2}} = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$

$r = 3\sqrt{2}$

95 $g(2) = 3 \quad g'(2) = -4$

a) $f(x) = x^2 - 4g(x)$

$f'(x) = 2x - 4g'(x)$

$f'(2) = 2(2) - 4 \cdot g'(2)$

$= 4 - 4(3)$

$= 4 - 12$

$= -8$

c) $f(x) = x^2 \cdot g(x)$

$f'(x) = 2x \cdot g(x) + x^2 \cdot g'(x)$

$f'(2) = (4)\,g(2) + (4)\,g'(2)$

$= (4)(3) + (4)(-4)$

$= 12 - 16$

$= -4$

b) $f(x) = \frac{x}{g(x)}$

$f'(x) = \frac{1 \cdot g(x) - x \cdot g'(x)}{[g(x)]^2}$

$f'(2) = \frac{1 \cdot g(2) - (2) \cdot g'(2)}{[g(2)]^2}$

$f'(2) = \frac{3 - (2)(-4)}{3^2} = \frac{3+8}{9} = \frac{11}{9}$

d) $f(x) = (g(x))^2$

$f'(x) = 2[g(x)]^1 \cdot g'(x)$

$f'(2) = 2(g(2)) \cdot g'(2)$

$= 2(3) \cdot (-4)$

$= -24$