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1 a) $f(x) = (3x^2 - 5)(2x^4 - x)$

$f'(x) = (3x^2-5)(2x^4-x) + (2x^4-x)(3x^2-5)$

$= (3x^2-5)(8x^3-1) + (2x^4-x)(6x)$

$= 24x^5 - 40x^3 - 3x^2 + 5 + 12x^5 - 6x^2$

$f'(x) = 36x^5 - 40x^3 - 9x^2 + 5$

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

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

$= \frac{(3x-1)(10x+2) - (5x^2+2x-6)(3)}{(3x-1)^2}$

$= \frac{30x^2 - 4x - 2 - (15x^2 + 6x - 18)}{(3x-1)^2}$

$= \frac{30x^2 - 4x - 2 - 15x^2 - 6x + 18}{(3x-1)^2}$

$f'(x) = \frac{15x^2 - 10x - 16}{(3x-1)^2}$

c) $f(x) = \frac{3}{x^3} - \frac{1}{x^4}$

$f'(x) = 3(x^{-3}) + (x^{-4})$

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

$= -9x^{-4} - 4x^{-5}$

$f'(x) = -\frac{9}{x^4} - \frac{4}{x^5}$

2. a) $f(x) = 3\sin x - 2\cos x$

$f'(x) = 3(\sin x) - 2(\cos x)$

$= 3(\cos x) - 2(-\sin x)$

$f'(x) = 3\cos x + 2\sin x$

b) $f(x) = \dfrac{\sin x + \cos x}{\cos x}$

$f'(x) = \dfrac{(\cos x)(\sin x + \cos x) - (\sin x + \cos x)(\cos x)}{\cos^2 x}$

$= \dfrac{(\cos x)(\cos x - \sin x) - (\sin x + \cos x)(-\sin x)}{\cos^2 x}$

$= \dfrac{\cos^2 x - \sin x \cdot \cos x - (-\sin^2 x + \cos x(-\sin x))}{\cos^2 x}$

$= \dfrac{\cos^2 x - \sin x \cdot \cos x + \sin^2 x - \cos x \cdot \sin x}{\cos^2 x}$

$= \dfrac{\cos^2 x + \sin^2 x}{\cos^2 x}$

$= \dfrac{1}{\cos^2 x}$

$f'(x) = \sec^2 x$

c) $f(x) = 1 - \cos^2 x$

$f'(x) = (\sin^2 x)\sin^2 x$

$= (\sin^2 x)(\sin x)$

$= \sin x(\sin x) + \sin x(\sin x)$

$= \sin x \cdot \cos x + \sin x \cos x$

$= 2\sin x \cdot \cos x$

$= \sin 2x$

3. $100 = 2x + 2y$

$2y = 100 - 2x$

$y = \frac{100 - 2x}{2}$

$y = 50 - x$

dik x = Panjang

y = Lebar

keliling = 100 m kawat

luas : $x\,y$

$= x(50 - x)$

luas $= 50x - x^2$

diturunkan

luas' $= 50 - 2x$

Samakan nol $50 - 2x = 0$

$50 = 2x$

$x = \frac{50}{2}$

$x = 25$

$y = 50 - x$

$y = 50 - 25$

$y = 25.$

luas max $= x \cdot y$

$= 25 \cdot 25$

$= 625$ m

4. $x + y = 10$

$y = 10 - x$

Perkalian max : $x\,y$

$= x(10 - x)$

$= 10x - x^2$

diturunkan $= 10 - 2x$

Samakan dengan nol

$10 - 2x = 0$

$10 = 2x$

$x = \frac{10}{2}$

$x = 5$

$y = 10 - x$

$y = 5$

Jadi jawabannya adalah 5

$5 + 5 = 10$

$5 \times 5 = 25$ (Perkalian max)

5. a) $\int 3x^2 + 4x \, dx$

$\left[\left(\frac{3}{3}x^3 + \frac{4}{2}x^2\right)\right]$

$\left(x^3 + 2x^2\right)\Big]$

$\left(x^3 + 2x^2\right)\Big] \Rightarrow x^3 + 2x^2$

b) $\int (x^4 + 3x)^{30} (4x^3 + 3) \, dx$

$\int (x^{120} + 3x^{30})(4x^3 + 3) \, dx$

$\int 4x^{123} + 3x^{120} + 12x^{90} + 9x^{30} \, dx$

$\left(\frac{4}{124}x^{124} + \frac{3}{121}x^{121} + \frac{12}{91}x^{91} + \frac{9}{31}x^{31}\right)\Big]$

$\left(\frac{1}{31}x^{124} + \frac{3}{121}x^{121} + \frac{12}{91}x^{91} + \frac{9}{31}x^{31}\right)\Big]$

$\frac{1}{31}x^{124} + \frac{3}{121}x^{121} + \frac{12}{91}x^{91} + \frac{9}{31}x^{31}$

6. a) $\int_1^3 (x+1)^2\,dx$

$\int_1^3 (x+1)(x+1)\,dx$

$\int_1^3 (x^2+2x+1)\,dx$

$\left(\frac{1}{3}x^3+x^2+x\right)\Big]_1^3$

$\left(\frac{1}{3}(3)^3+(3)^2+3\right)-\left(\frac{1}{3}(1)^3+(1)^2+1\right)$

$(9+9+3)-\left(\frac{1}{3}+1+1\right)$

$= 21-\frac{7}{3} = \frac{63-7}{3}$

$= \frac{56}{3}$ //

b. $\int_{-1}^{2} 4x^5-x^3\,dx$

$\left(\frac{4}{6}x^6-\frac{1}{4}x^4\right)\Big]_{-1}^{2} = \left(\frac{2}{3}x^6-\frac{1}{4}x^4\right)\Big]_{-1}^{2}$

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

$= \left(\frac{128}{3}-\frac{16}{4}\right)-\left(\frac{2}{3}-\frac{1}{4}\right) = \left(\frac{128}{3}-4\right)-\left(\frac{8-3}{12}\right)$

$$= \left(\frac{128 - 12}{3}\right) - \frac{5}{12}$$

$$= \frac{116}{3} - \frac{5}{12}$$

$$= \frac{464 - 5}{12}$$

$$= \frac{459}{12}$$

$$= \frac{153}{4}$$

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