

أدرب وأحل المسائل

التكامل

أجد كلاً من التكاملات الآتية:

$$\int (x^2(2x^3+5))^4 dx \quad (1)$$

$$u=2x^3+5 \Rightarrow du=6x^2 dx \Rightarrow dx = \frac{du}{6x^2} \int x^2(2x^3+5)^4 dx = \int x^2 u^4 \times \frac{du}{6x^2} = \int \frac{1}{6} u^4 du = \frac{1}{6} \times \frac{u^5}{5} + C = \frac{1}{30} (2x^3+5)^5 + C$$

$$\int (x^2x+3) dx \quad (2)$$

$$u=x+3 \Rightarrow dx=du, x=u-3 \int x^2x+3 dx = \int x^2 u du = \int (u-3)^2 u du = \int (u^3 - 6u^2 + 9u) du = \frac{1}{4} u^4 - 2u^3 + \frac{9}{2} u^2 + C = \frac{1}{4} (x+3)^4 - 2(x+3)^3 + \frac{9}{2} (x+3)^2 + C = \frac{1}{4} (x+3)^4 - 2(x+3)^3 + \frac{9}{2} (x+3)^2 + C$$

$$\int (x(x+2))^3 dx \quad (3)$$

$$u=x+2 \Rightarrow dx=du, x=u-2 \int x(x+2)^3 dx = \int x u^3 du = \int (u-2) u^3 du = \int (u^4 - 2u^3) du = \frac{1}{5} u^5 - \frac{2}{4} u^4 + C = \frac{1}{5} (x+2)^5 - \frac{1}{2} (x+2)^4 + C$$

$$\int (x^x+4) dx \quad (4)$$

$$u=x+4 \Rightarrow dx=du, x=u-4 \int x^x+4 dx = \int x u du = \int (u-4) u du = \int (u^2 - 4u) du = \frac{1}{3} u^3 - 2u^2 + C = \frac{1}{3} (x+4)^3 - 2(x+4)^2 + C = \frac{1}{3} (x+4)^3 - 2(x+4)^2 + C$$

$$\int (2x dx) (5 \cos \sin) \quad (5)$$

$$x \Rightarrow dx = du - \sin x \Rightarrow du dx = -\sin x - 1 \int x^2 dx = \int \sin x \cos \sin \int x^2 dx = \int (1 - 2u^2) du = u - \frac{2}{3} u^3 + C = \cos x - \frac{2}{3} \cos^3 x + C$$

$$\int (e^{3x} e^{x+1}) dx \quad (6)$$

$$u=e^{x+1} \Rightarrow du=dx \int e^{3x} e^{x+1} dx = \int e^{3x} u dx = \int e^{3x} u du = \int (u-1)^2 u du = \int (u^3 - 2u^2 + u) du = \frac{1}{4} u^4 - \frac{2}{3} u^3 + \frac{1}{2} u^2 + C = \frac{1}{4} (e^{x+1})^4 - \frac{2}{3} (e^{x+1})^3 + \frac{1}{2} (e^{x+1})^2 + C$$

$$\int x dx \quad (7) \sec^4 f$$

$$x \Rightarrow du dx = \sec x \Rightarrow dx = \frac{du}{\sec x} = \frac{du}{1 + \tan^2 x} \Rightarrow dx = \frac{du}{1 + u^2}$$

$$\int x dx = \int \frac{u}{1 + u^2} du = \frac{1}{2} \int \frac{2u}{1 + u^2} du = \frac{1}{2} \int \frac{d(1 + u^2)}{1 + u^2} = \frac{1}{2} \ln |1 + u^2| + C = \frac{1}{2} \ln |1 + \tan^2 x| + C = \frac{1}{2} \ln |\sec^2 x| + C = \frac{1}{2} \ln |\sec x| + C$$

$$\int x dx \quad (8) x \cos^2 \tan f$$

$$x \Rightarrow du dx = \sec^2 x \Rightarrow dx = \frac{du}{\sec^2 x} = \frac{du}{1 + \tan^2 x} = \frac{du}{1 + u^2}$$

$$\int x dx = \int \frac{u}{1 + u^2} du = \frac{1}{2} \int \frac{2u}{1 + u^2} du = \frac{1}{2} \int \frac{d(1 + u^2)}{1 + u^2} = \frac{1}{2} \ln |1 + u^2| + C = \frac{1}{2} \ln |1 + \tan^2 x| + C = \frac{1}{2} \ln |\sec^2 x| + C = \frac{1}{2} \ln |\sec x| + C$$

$$\int x dx \quad (9) \ln \sin f$$

$$u = \sin x \Rightarrow du dx = \cos x \Rightarrow dx = \frac{du}{\cos x} = \frac{du}{\sqrt{1 - u^2}}$$

$$\int x dx = \int \frac{\ln u}{\sqrt{1 - u^2}} du = -\cos^{-1} u + C = -\cos^{-1} \sin x + C = -\frac{\pi}{2} + x + C = x - \frac{\pi}{2} + C$$

$$\int x dx \quad (10) x^2 \cos \sin f$$

$$x \Rightarrow du dx = 2x \cos x \Rightarrow dx = \frac{du}{2x \cos x} = \frac{du}{2 \sqrt{1 - u^2}}$$

$$\int x dx = \int \frac{u}{2 \sqrt{1 - u^2}} du = -\frac{1}{2} \sqrt{1 - u^2} + C = -\frac{1}{2} \sqrt{1 - \sin^2 x} + C = -\frac{1}{2} |\cos x| + C = -\frac{1}{2} \cos x + C$$

$$\int (2e^x - 2e^{-x})(e^x + e^{-x})^2 dx \quad (11) f$$

$$u = e^x + e^{-x} \Rightarrow du dx = e^x - e^{-x} \Rightarrow dx = \frac{du}{e^x - e^{-x}}$$

$$\int (2e^x - 2e^{-x})(e^x + e^{-x})^2 dx = \int \frac{2(u - 1)(u + 1)^2}{u - 1} du = \int 2(u + 1)^2 du = \frac{2}{3} (u + 1)^3 + C = \frac{2}{3} (e^x + e^{-x} + 1)^3 + C$$

$$\int x(x+1)^{x+1} dx \quad (12) - f$$

$$u = x + 1 \Rightarrow dx = du, x = u - 1 \Rightarrow \int x(x+1)^{x+1} dx = \int (u-1)u^{u-1} du = \int (u^u - u^{u-1}) du = \frac{1}{2} u^u - \frac{1}{2} u^{u-1} + C = \frac{1}{2} (x+1)^{x+1} - \frac{1}{2} (x+1)^x + C$$

$$\int x(x+10)^3 dx \quad (13) f$$

$$u = x + 10 \Rightarrow dx = du, x = u - 10 \Rightarrow \int x(x+10)^3 dx = \int (u-10)u^3 du = \int (u^4 - 10u^3) du = \frac{1}{5} u^5 - 10 \frac{1}{4} u^4 + C = \frac{1}{5} (x+10)^5 - \frac{5}{2} (x+10)^4 + C$$

$$\int x^2 dx \quad (14) x^2 \tan^7 \sec^2 f$$

$$x^2 dx = \int \sec^2 x \tan^7 x^2 \int \sec^2 x^2 \Rightarrow dx = 2 du \sec^2 x^2 \Rightarrow du dx = 12 \sec^2 u = \tan x^2 + C x^2 = 2 \int u^7 du = 14 u^8 + C = 14 \tan^8 x^2 u^7 \times 2 du \sec^2$$

$$(x dx (15 x \sec x + e \sin \sec^3 \int$$

$$x x e \sin x dx + \int \cos x) dx = \int \sec^2 x e \sin x + \cos x dx = \int (\sec^2 x \sec x + e \sin \sec^3 \int x dx + x dx = \int \sec^2 x \sec x + e \sin x \int \sec^3 x \Rightarrow dx = du \cos x \Rightarrow du dx = \cos dx u = \sin x + C x + e \sin x + e u + C = \tan x + \int e u du = \tan x = \tan x e u \times du \cos \int \cos$$

$$(x dx (16 x^3) \cos^3 \sin + 1) \int$$

$$x dx = \int (1 + u^3) \cos^3 x^3) \cos^3 x \int (1 + \sin x \Rightarrow dx = du \cos x \Rightarrow du dx = \cos u = \sin x) du = \int (1 + u^3) (1 - u^2) du = \int (1 + u^3) (1 - \sin^2 x) = \int (1 + u^3) \cos^2 x du \cos) du = \int (1 + u^3) (1 - u^2) du = \int (1 - u^2 + u^3 - u^7) du = u - \frac{1}{3} u^3 + \frac{3}{4} u^4 - \frac{1}{8} u^8 + C x - \frac{1}{3} \sin^3 x + \frac{3}{4} \sin^4 x - \frac{1}{8} \sin^8 x + C = \sin$$

$$(x dx (17 x \sec^5 \sin \int$$

$$x \int \sin x \Rightarrow dx = du - \sin x \Rightarrow du dx = -\sin x dx u = \cos x \cos - 5 x dx = \int \sin x \sec^5 \sin \int x + x = - \int u - 5 du = 14 u - 4 + C = 14 \cos - 4 x u - 5 \times du - \sin x dx = \int \sin x \sec^5 n x + C C = 14 \sec^4$$

$$(x dx (18 x \cos^3 x + \tan \sin \int$$

$$x + s x (\sec x \sec x) dx = \int \tan x \sec^3 x + \tan x \sec^2 x dx = \int (\tan x \cos^3 x + \tan \sin \int x dx \cos^3 x + \tan x \int \sin x \sec x \Rightarrow dx = du \tan x \sec x \Rightarrow du dx = \tan x) dx u = \sec^2 x = \int (u + u^2) du = 12 u^2 + 13 u^3 + C = 12 \sec x \sec x (u + u^2) du \tan x \sec x = \int \tan x + C x + 13 \sec^3 2$$

أجد قيمة كلا من التكمالات الآتية:

$$(2 x dx (19 x^{1 - \cos 20\pi/4} \sin \int$$

$$|2 x^2 x = |\sin^2 x = \sin^2 \cos^2 - 1$$

لكن الزاوية $2x$ تكون ضمن الربع الأول عندما $0 < 2x < \pi/4$

لذا فإن $2x > 0 \sin$ ويكون $2x^2 x = \sin^2 \sin$

$$x \Rightarrow x dx u = \sin x \cos 2x dx = \int_0^{\pi/4} 2 \sin 2x \sin 2x dx = \int_0^{\pi/4} 2 \sin^2 x dx = \int_0^{\pi/4} 2(1 - \cos 2x) dx = 2x - \sin 2x \Big|_0^{\pi/4} = 2 \cdot \frac{\pi}{4} - \sin \frac{\pi}{2} = \frac{\pi}{2} - 1$$

$$\int_0^{\pi/2} x^2 dx = \frac{1}{3} x^3 \Big|_0^{\pi/2} = \frac{1}{3} \left(\frac{\pi}{2}\right)^3 = \frac{\pi^3}{24}$$

$$x^2 dx = \int_0^{\pi/2} u = x^2 \Rightarrow du dx = 2x \Rightarrow dx = \frac{du}{2x} \quad x = \frac{\pi}{2} \Rightarrow u = \frac{\pi^2}{4} \quad x = 0 \Rightarrow u = 0$$

$$\int_0^{\pi/2} \pi^2 x \sin \pi^2 x dx = \int_0^{\pi^2/4} \frac{u}{2} \cos u du = \frac{1}{2} \int_0^{\pi^2/4} u \cos u du = \frac{1}{2} \left[u \sin u + \cos u \right]_0^{\pi^2/4} = \frac{1}{2} \left(\frac{\pi^2}{4} \sin \frac{\pi^2}{4} + \cos \frac{\pi^2}{4} - 1 \right)$$

$$\int_0^1 (1+x^3)^2 dx = \int_0^1 (1+2x^3+x^6) dx = \left[x + \frac{2}{4}x^4 + \frac{1}{7}x^7 \right]_0^1 = 1 + \frac{1}{2} + \frac{1}{7} = \frac{17}{14}$$

$$u = 1+x^2 \Rightarrow du dx = 2x \Rightarrow dx = \frac{du}{2x} \quad x^2 = u - 1 \quad x = 0 \Rightarrow u = 1 \quad x = 1 \Rightarrow u = 2$$

$$\int_0^1 (1+x^3)^2 dx = \int_1^2 (u-1)^2 \frac{du}{2(u-1)} = \frac{1}{2} \int_1^2 (u-1) du = \frac{1}{2} \left[\frac{1}{2}u^2 - u \right]_1^2 = \frac{1}{2} \left(\frac{1}{2}(2^2) - 2 - \left(\frac{1}{2}(1^2) - 1 \right) \right) = \frac{1}{2} \left(2 - 2 - \frac{1}{2} + 1 \right) = \frac{1}{4}$$

$$\int_0^{\pi/3} x \tan 50\pi/3 \sec^2 x dx = \int_0^{\pi/3} x \sec^2 x dx$$

$$x \tan x = 0 \Rightarrow u = 0 \quad x = \pi/3 \Rightarrow u = 3 \quad \int_0^{\pi/3} \pi^3 \sec^2 x dx = \int_0^3 \frac{u}{2} \sec^2 u du = \frac{1}{2} \int_0^3 u \sec^2 u du = \frac{1}{2} \left[u \tan u + \ln |\sec u| \right]_0^3 = \frac{1}{2} \left(3 \tan 3 + \ln |\sec 3| - 0 \right)$$

$$\int_0^2 (x-1)e^{(x-1)^2} dx = \int_0^2 (x-1)e^{(x-1)^2} dx$$

$$u = (x-1)^2 \Rightarrow du dx = 2(x-1) \Rightarrow dx = \frac{du}{2(x-1)} \quad x = 0 \Rightarrow u = 1 \quad x = 2 \Rightarrow u = 1$$

$$\int_0^2 (x-1)e^{(x-1)^2} dx = \int_1^1 \frac{u}{2} e^u \frac{du}{2} = 0$$

$$\int_0^2 (x^2+1)^2 dx = \int_0^2 (x^4+2x^2+1) dx = \left[\frac{1}{5}x^5 + \frac{2}{3}x^3 + x \right]_0^2 = \frac{32}{5} + \frac{16}{3} + 2 = \frac{194}{15}$$

$$u = 2+x \Rightarrow du dx = 1 \Rightarrow dx = du \quad x = 3 \Rightarrow u = 5 \quad x = 4 \Rightarrow u = 6$$

$$\int_3^4 (2+x)^2 dx = \int_5^6 u^2 du = \left[\frac{1}{3}u^3 \right]_5^6 = \frac{1}{3}(6^3 - 5^3) = \frac{1}{3}(216 - 125) = \frac{91}{3}$$

$$\int_0^1 10x(1+x^3)^2 dx = \int_0^1 10x(1+x^3)^2 dx$$

$$u = 1+x^3 \Rightarrow du dx = 3x^2 \Rightarrow dx = \frac{du}{3x^2} \quad x = 0 \Rightarrow u = 1 \quad x = 1 \Rightarrow u = 2$$

$$\int_0^1 10x(1+x^3)^2 dx = \int_1^2 \frac{10u}{3} du = \frac{10}{3} \left[\frac{1}{2}u^2 \right]_1^2 = \frac{10}{3} \left(\frac{1}{2}(2^2) - \frac{1}{2}(1^2) \right) = \frac{10}{3} \left(2 - \frac{1}{2} \right) = \frac{10}{3} \cdot \frac{3}{2} = 5$$

$$\int_0^{\pi/6} x \sin 0\pi/6 \cos x dx = \int_0^{\pi/6} x \cos x dx$$

$$x=0 \Rightarrow u=1 \quad x=\pi/6 \Rightarrow u=3/2 \quad \int_0^{\pi/6} 2 \cos x \Rightarrow dx = du - \sin x \Rightarrow du dx = -\sin u = \cos 2$$

$$2(2322|132 = -1 \ln x = -\int 1322 u du = -2u \ln x du - \sin x dx = \int 1322 u \sin x \sin$$

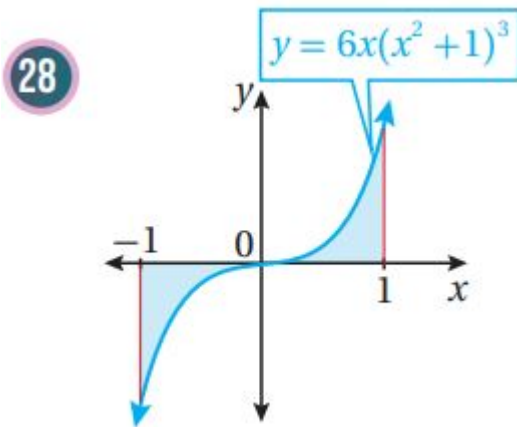
$$-2) \approx 0.256$$

$$\int (x dx (27x \cot 5\pi/4 \pi/2 \csc 2 \int$$

$$x=\pi/2 \Rightarrow u=0 \quad x=\pi/4 \Rightarrow u=1 \quad \int_{\pi/4}^{\pi/2} 2x \Rightarrow dx = du - \csc 2x \Rightarrow du dx = -\csc 2u = \cot$$

$$x = \int 10 - u^5 du = -16u^6 |_{10} = 16xu^5 du - \csc 2x dx = \int 10 \csc 2x \cot 5 \csc 2$$

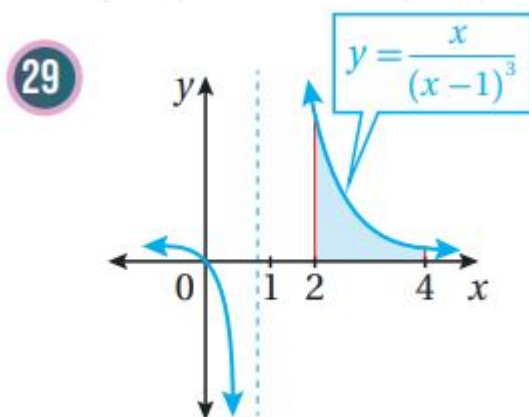
أجد مساحة المنطقة المظللة في كل من التمثيلات البيانية الآتية:



$$A = -\int_{-1}^0 6x(x^2+1)^3 dx + \int_0^1 6x(x^2+1)^3 dx \quad u = x^2+1 \Rightarrow du dx = 2x \Rightarrow dx = du / 2x$$

$$u^2 x x = -1 \Rightarrow u = 2x = 0 \Rightarrow u = 1 \quad x = 1 \Rightarrow u = 2 \quad A = -\int_2^1 16xu^3 du + \int_1^2 126xu^3 du$$

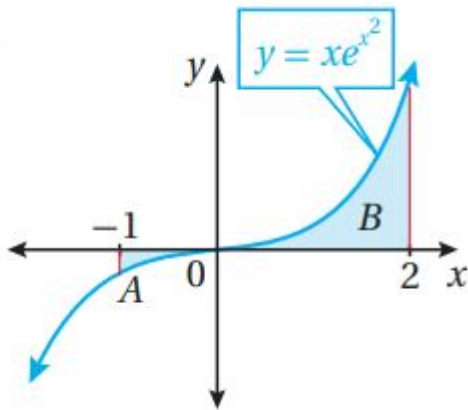
$$x = \int 123u^3 du + \int 123u^3 du = \int 126u^3 du = 64u^4 |_{12} = 452$$



$$A = \int_2^4 \frac{x}{(x-1)^3} dx \quad u = x-1 \Rightarrow dx = du, x = u+1 \quad x=2 \Rightarrow u=1 \quad x=4 \Rightarrow u=3 \quad A = \int_1^3 \frac{24x}{(x-1)^3} dx$$

$$(x-1)^3 dx = \int 13u + 1u^3 du = \int 13(u-2+u-3) du = (-u-1-12u-2) |_{13} = -13 - 12(19) + 1 + 12 = 109$$

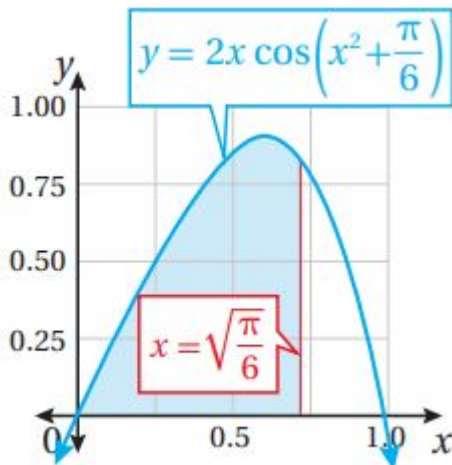
30



$$u = x^2 \Rightarrow \frac{du}{dx} = 2x \Rightarrow dx = \frac{du}{2x} \Rightarrow \frac{dx}{x} = \frac{du}{2u} \Rightarrow \int \frac{dx}{x} = \frac{1}{2} \int \frac{du}{u} \Rightarrow \ln|x| = \frac{1}{2} \ln|u| \Rightarrow \ln|x| = \frac{1}{2} \ln|x^2| \Rightarrow \ln|x| = \ln|x|$$

$$A = \int_{-1}^0 x e^{x^2} dx + \int_0^2 x e^{x^2} dx = \int_{-1}^0 \frac{1}{2} e^u du + \int_0^2 \frac{1}{2} e^u du = \frac{1}{2} [e^u]_{-1}^0 + \frac{1}{2} [e^u]_0^2 = \frac{1}{2} (e^0 - e^{-1}) + \frac{1}{2} (e^2 - e^0) = \frac{1}{2} (1 - \frac{1}{e} + e^2 - 1) = \frac{1}{2} (e^2 - \frac{1}{e}) \approx 27.658$$

31



$$u = x^2 + \frac{\pi}{6} \Rightarrow \frac{du}{dx} = 2x \Rightarrow dx = \frac{du}{2x} \Rightarrow \frac{dx}{x} = \frac{du}{2u} \Rightarrow \int \frac{dx}{x} = \frac{1}{2} \int \frac{du}{u} \Rightarrow \ln|x| = \frac{1}{2} \ln|u| \Rightarrow \ln|x| = \frac{1}{2} \ln|x^2 + \frac{\pi}{6}|$$

$$A = \int_0^{\sqrt{\pi/6}} 2x \cos(x^2 + \frac{\pi}{6}) dx + \int_{\sqrt{\pi/6}}^1 2x \cos(x^2 + \frac{\pi}{6}) dx = \int_0^{\sqrt{\pi/6}} \cos u du + \int_{\sqrt{\pi/6}}^1 \cos u du = [\sin u]_0^{\sqrt{\pi/6}} + [\sin u]_{\sqrt{\pi/6}}^1 = \sin(\sqrt{\pi/6}) - \sin(0) + \sin(1) - \sin(\sqrt{\pi/6}) = \sin(1) - \sin(0) = \sin(1) \approx 0.8415$$

في كل مما يأتي المشتقة الأولى للاقتران $f(x)$ ، ونقطة يمر بها منحنى $y=f(x)$.
أستعمل المعلومات المعطاة لإيجاد قاعدة الاقتران $f(x)$:

$$f'(x) = 2x(4x^2 - 10)^2; (2, 10) \quad (32)$$

$$f(x) = \int f'(x) dx = \int 2x(4x^2 - 10)^2 dx \quad u = 4x^2 - 10 \Rightarrow \frac{du}{dx} = 8x \Rightarrow dx = \frac{du}{8x} \Rightarrow f(x) = \int 2x u^2 \frac{du}{8x} = \frac{1}{4} \int u^2 du = \frac{1}{4} \cdot \frac{1}{3} u^3 + C = \frac{1}{12} (4x^2 - 10)^3 + C$$

$$f(2) = \frac{1}{12} (216) + C = 10 \Rightarrow C = -8 \Rightarrow f(x) = \frac{1}{12} (4x^2 - 10)^3 - 8$$

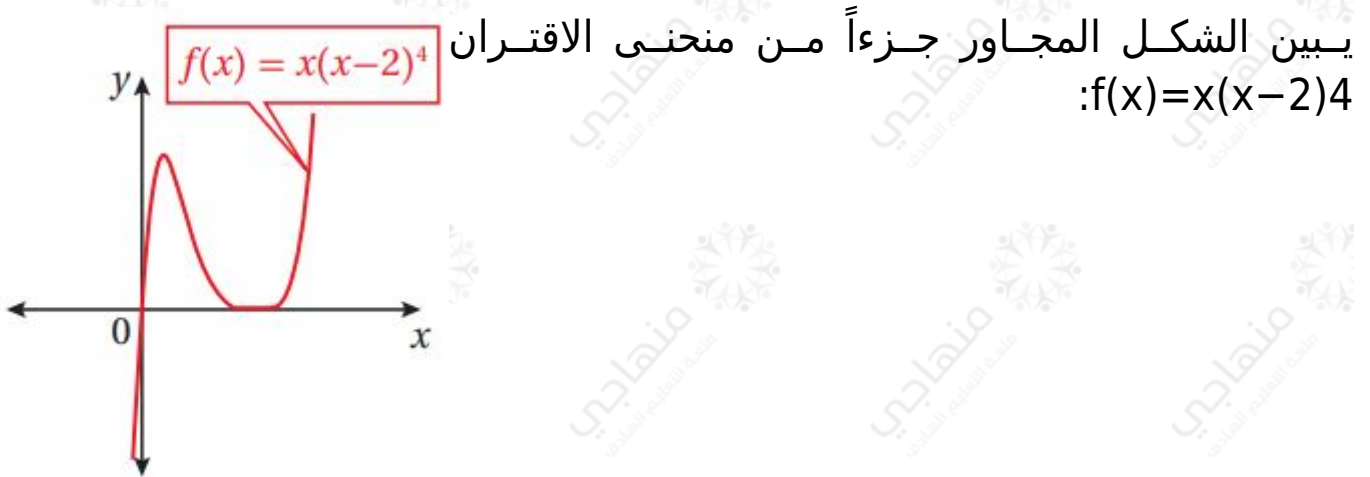
8

$$(f'(x) = x^2 e^{-0.2x^3}; (0, 32)) \quad (33)$$

$$f(x) = \int f'(x) dx = \int x^2 e^{-0.2x^3} dx \quad u = -0.2x^3 \Rightarrow du/dx = -0.6x^2 \Rightarrow dx = du / -0.6x^2$$

$$x^2 f(x) = \int x^2 e^u du / -0.6x^2 = -1/0.6 \int e^u du = -5/3 e^u + C \Rightarrow f(x) = -5/3 e^{-0.2x^3} + C$$

$$+ C f(0) = -5/3 + C 32 = -5/3 + C \Rightarrow C = 196 \Rightarrow f(x) = -5/3 e^{-0.2x^3} + 196$$



(34) أجد إحداثي نقطة تماس الاقتران مع المحور x

نجد أصفار الاقتران بحل المعادلة $f(x) = 0$

$$x(x-2)^4 = 0 \Rightarrow x = 0, x = 2$$

نقطة التقاطع $(0, 0)$, فتكون نقطة التماس $(2, 0)$

ويمكن التحقق بحساب $f'(2)$:

$$f'(x) = (x-2)^4 + 4x(x-2)^3 \quad f'(2) = (2-2)^4 + 4(2)(2-2)^3 = 0$$

(35) أجد مساحة المنطقة المحصورة بين منحنى الاقتران $f(x)$ والمحور x

$$A = \int_0^2 x(x-2)^4 dx \quad u = x-2 \Rightarrow dx = du, x = u+2 \quad x=0 \Rightarrow u = -2 \quad x=2 \Rightarrow u = 0$$

$$A = \int_{-2}^0 (u+2)u^4 du = \int_{-2}^0 (u^5 + 2u^4) du = (1/6 u^6 + 2/5 u^5) \Big|_{-2}^0$$

$$= 0 - (1/6 (-2)^6 + 2/5 (-2)^5) = 32/15$$

(36) يتحرك جسيم في مسار مستقيم، وتعطى سرعته المتجهة بالاقتران:

$\omega t \cos 2v(t) = \sin$ حيث t الزمن بالثواني، و v سرعته المتجهة بالمتري لكل ثانية،

و b ثابت، إذا انطلق الجسم من نقطة الأصل، فأجد موقعه بعد t ثانية.

$$wts(t) = wt \Rightarrow dt = du - w \sin wt \Rightarrow dudx = -w \sin wt dt u = \cos wt \cos 2s(t) = f \sin wt + C wt = -1 w \int u^2 du = -13 w u^3 + C \Rightarrow s(t) = -130 \cos 3 w t u^2 du - w \sin f \sin$$

لكن $s(0) = 0$ لأن الجسم انطلق من نقطة الأصل.

$$wt + 13ws(0) = -13w + C0 = -13w + C \Rightarrow C = 13w \Rightarrow s(t) = -13w \cos 3$$



(37) طب: يمثل الاقتران $C(t)$ تركيز دواء في الدم بعد t دقيقة من حقنه في جسم مريض، حيث C مقيسة بالمليغرام لكل سنتيمتر مكعب (mg/cm^3)، إذا كان تركيز الدواء لحظة حقنه في جسم المريض $0.5 mg/cm^3$ ، وأخذ يتغير بمعدل $C'(t) = -0.01e^{-0.01t}(1+e^{-0.01t})^2$ ، فأجد $C(t)$.

$$C(t) = \int C'(t) dt = \int -0.01e^{-0.01t}(1+e^{-0.01t})^2 dt u = 1+e^{-0.01t} \Rightarrow dudt = -0.01e^{-0.01t} \Rightarrow dt = du - 0.01e^{-0.01t} C(t) = \int -0.01e^{-0.01t} u^2 \times du - 0.01e^{-0.01t} = \int u^2 du = -u^{-1} + K$$

استعمل الرمز K لثابت التكامل بدل C المعتاد لتمييز ثابت التكامل عن رمز الاقتران C :

$$C(t) = -(1+e^{-0.01t})^{-1} + K C(0) = -(2)^{-1} + K12 = -12 \Rightarrow K = 1 \Rightarrow C(t) = -(1+e^{-0.01t})^{-1} + 1 C(t) = -11 + e^{-0.01t} + 1$$

(38) أجد قيمة $\int \ln \ln x dx - 2x^3 \ln \ln x$ ، ثم اكتب الإجابة بالصيغة الآتية: $dab + c \ln$ ، حيث a, b, c, d ثوابت صحيحة.

$$3-2=3-2=1x=|3 \Rightarrow u = e^{\ln u} = e^x - 2 \Rightarrow dudx = e^x \Rightarrow dx = du e^x e^x = u + 2x = \ln 4e^4 x e^x - 2dx = \int 12e^4 x u du e^x = \int 12e^3 x u d^3 \ln 4 - 2 = 4 - 2 = 2 \int \ln 4 \Rightarrow u = e^{\ln u} u = \int 12(u+2)^3 u du = \int 12(u^3 + 6u^2 + 12u + 8) u du = \int 12(u^4 + 6u^3 + 12u^2 + 8u) du |u|^{12} = (13u^3 + 3u^2 + 12u + 8 \ln$$

(39) إذا كان: $xf'(x) = \tan$ ، وكان: $f(3) = 5$ ، فأثبت أن $\ln |\cos x| + 53 \cos | \cos f(x) = \ln$.

$$3| + C5 = -\ln |\cos x| + Cf(3) = -\ln |\cos x dx = -\ln x \cos x dx = -\int -\sin f(x) = \int \tan$$

$$x|+53\cos|\cos3|=\ln|\cos x|+5+\ln|\cos 3|f(x)=-\ln|\cos 3|+C\Rightarrow C=5+\ln|\cos$$