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Parcial Simulacro # 1 - Calculo Integral 2019-08-26

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

$u = x^2$

$du = 2x\,dx$

$\frac{du}{2} = x\,dx$

$\eth = \tan^{-1}(u) \qquad d\beta = du$

$d\eth = \frac{1}{u^2+1}\,du \qquad \beta = u$

$\eth\beta - \int \beta\, d\eth$

$= \tan^{-1}(u)\,u - \int u \cdot \frac{1}{u^2+1}\,du$

$= \tan^{-1}(u)\cdot u - \int \frac{u}{u^2+1}\,du$

$w = u^2+1$

$\frac{dw}{2} = u\,du$

$\frac{1}{2}\int \frac{dw}{w}$

$\frac{1}{2}\ln|w| = \frac{1}{2}\ln|u^2+1|$

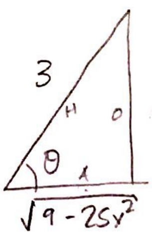
$\frac{1}{2}\left[\tan^{-1}(u)\cdot u - \frac{1}{2}\ln|u^2+1|\right]$

$\frac{1}{2}\left[\tan^{-1}(x^2)\,x^2 - \frac{1}{2}\ln|x^4+1|\right] + C$

$\square$

① ⓑ $\displaystyle\int \frac{x^2}{\sqrt{9-25x^2}}\,dx$

$\sin^{-1}(\sin\theta) = \sin^{-1}\left(\frac{5x}{3}\right)$



$S\ \frac{O}{H}$ $\quad C\ \frac{A}{H}$ $\quad T\ \frac{O}{A}$

$\csc\theta = \frac{H}{O}$ $\quad \sec\theta = \frac{H}{A}$ $\quad \cot\theta = \frac{A}{O}$

$x = \frac{3}{5}\sin\theta$

$dx = \frac{3}{5}\cos\theta\, d\theta$

$\sin\theta = \frac{5x}{3}$

$3\sin\theta = 5x$

Para x: $\boxed{\frac{3}{5}\sin\theta = x}$

Para $\sqrt{9-25x^2}$: $\boxed{3\cos\theta = \sqrt{9-25x^2}}$

$c^2 = a^2 + b^2$

$9 = 25x^2 + b^2$

$\sqrt{9-25x^2} = b$

$\cos\theta = \frac{\sqrt{9-25x^2}}{3}$

$3\cos\theta = \sqrt{9-25x^2}$

$$\therefore \int \frac{\left[\frac{3}{5}\sin\theta\right]^2}{3\cos\theta}\cdot\frac{3}{5}\cos\theta\, d\theta = \int \frac{\frac{9\sin^2\theta}{25}}{\frac{3\cos\theta}{1}}\cdot\frac{3}{5}\cos\theta\, d\theta$$

$$= \int \frac{\cancel{3}\cdot 3\sin^2\theta\cdot 1}{25\cdot\cancel{3}\cos\theta}\cdot\frac{3}{5}\cos\theta\, d\theta = \int \frac{3\cdot 3\cdot\sin^2\theta\cdot\cancel{\cos\theta}}{25\cdot 5\cdot\cancel{\cos\theta}}\, d\theta =$$

$$= \frac{9}{125}\int \sin^2\theta\, d\theta = \frac{9}{125}\int\left(\frac{1}{2} - \frac{\sin(2\theta)}{2}\right)d\theta = \frac{9}{125}\left\{\int\frac{1}{2}d\theta - \frac{1}{2}\int\sin(2\theta)d\theta\right\}$$

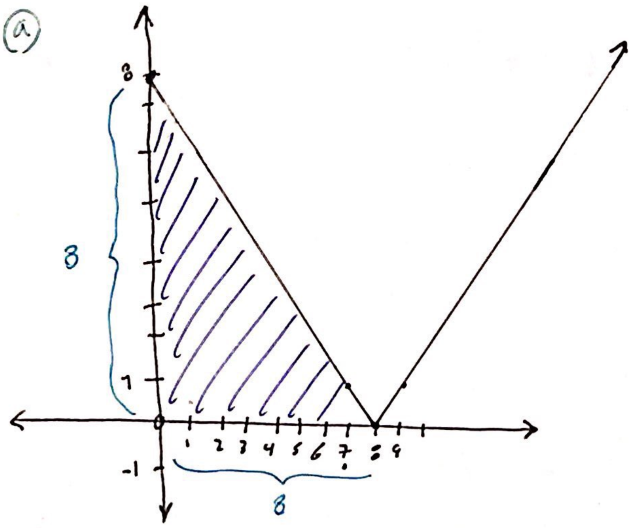
$$= \frac{9}{125}\left\{\frac{\theta}{2} - \frac{1}{2}\left(\frac{-\cos(2\theta)}{2}\right)\right\} = \frac{9}{125}\left[\frac{\theta}{2} + \frac{\cos(2\theta)}{4}\right]$$

$$\frac{9}{125}\left[\frac{\sin^{-1}(5x/3)}{2} + \frac{2\cdot\frac{5x}{3}\cdot\frac{\sqrt{9-25x^3}}{3}}{4}\right] + C$$

$\square$

③

ⓐ



$A = 8 * 8 * \frac{1}{2}$

ⓑ $\underline{A = 32}$

ⓒ $A = \int_0^8 x - 8 \quad = \frac{x^2}{2} - 8x \Big]_0^8$

-32

⑤ $v(t) = 1 - (t^2 - 4t + 4)$

$v(t) = 1 - t^2 + 4t + 4$

$v(t) = -t^2 + 4t + 5 \qquad 0 \leq t \leq 2$

$\int v(t)\,dt = -\int t^2\,dt + 4\int t\,dt + 5\int 1\,dt$

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

$f(x) = -\frac{t^3}{3} + 2t^2 + 5t \Big]_0^2 = \left\{-\frac{2^3}{3} + 2(2)^2 + 5(2)\right\} - \{0\}$

$-\frac{8}{3} + 8 + 10$

$-\frac{8}{3} + \frac{18 \cdot 3}{3} = \frac{-8 + 18 \cdot 3}{3} = \frac{46}{3}$

⑥ $f(x) = \int_{\sin x}^{2e^x - 2} \sqrt{t^2 + 2t + 4}\, dt$

$= \left\{ \sqrt{(2e^x - 2)^2 + 2(2e^x - 2) + 4} \cdot 2e^x \right\} - \left\{ \sqrt{\sin^2(x) - 2\sin(x) + 4} \cdot \cos x \right\}$

$m = \sqrt{\cancel{(2e^0 - 2)^2}_{0} + \cancel{2(0)} + 4} \cdot 2 - \sqrt{4}$

$\sqrt{4} \cdot 2 - \sqrt{4}$

$2 \cdot 2 - 2 = \underline{2}$

$y - y_1 = m(x - x_1)$

$y = f(a) + f'(a)(x - a)$

$f(a) = 0 + \underline{2(x - 0)}$

□

① ⓒ $$\int \frac{x \cdot e^x}{(x+1)^2} \cdot dx$$