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20. In order to evaluate $\int t\sin(t^2)\,dt$ using substitution, you would probably use $u =$

A. t^2

B. $\cos(t^2)2t\,dt$

C. $2t\,dt$

D. $\sin(t^2)$

E. t

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22. In order to evaluate $\int \frac{x}{\sqrt{1-x^2}}\,dx$ using substitution, you would set $u =$

A. x

B. $1-x^2$

C. $1-x$

D. $\frac{1}{\sqrt{1-x^2}}$

E. Substitution won't work.

↳ rewrite to see the chain better

$\int x(1-x^2)^{-1/2}\,dx$

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23. If $g(x) = x\sqrt{9-x^2}$, the antiderivative $G(x) =$

A. $\frac{3}{2}x^2 - \frac{1}{3}x^3 + C$

B. $\frac{3}{2}x^2 - x^3 + C$

C. $-\frac{1}{2}((9-x^2)^{\frac{3}{2}}) + C$

D. $\frac{(9-x^2)^{\frac{3}{2}}}{3} + C$

E. $-\frac{1}{3}\left(\sqrt{9-x^2}\right)^3 + C$

$\int x(9-x^2)^{1/2}\,dx$ $\quad u = 9-x^2$

$= \int x\,u^{1/2}\cdot\frac{du}{-2x}$ $\quad \frac{du}{dx} = -2x$

$= \int -\frac{1}{2}u^{1/2}\,du$ $\quad \frac{du}{-2x} = dx$

$= -\frac{1}{2}\left(\frac{2}{3}u^{3/2}\right) + C$

$= -\frac{1}{3}u^{3/2} + C$

$= -\frac{1}{3}(9-x^2)^{3/2} + C$

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24. Given that $g'(t) = (\sin t)(5+5\cos t)^3$, find $g(t)$ if $g(0) = 0$.

A. $g(t) = -\frac{1}{4}(5+5\cos t)^4$

B. $g(t) = -\frac{1}{4}(5+5\cos t)^4 + 2,500$

C. $g(t) = \frac{1}{4}(5+5\cos t)^4 - 2,500$

D. $g(t) = -\frac{1}{20}(5+5\cos t)^4 + 500$

E. $g(t) = \frac{1}{20}(5+5\cos t)^4 - 500$

$g(t) = \int(\sin t)(5+5\cos t)^3\,dt$ $\quad u = 5+5\cos t$

$= \int \sin t\,(u)^3\cdot\frac{du}{-5\sin t}$ $\quad \frac{du}{dt} = -5\sin t$

$= -\frac{1}{5}\int u^3\,du$ $\quad \frac{du}{-5\sin t} = dt$

$= -\frac{1}{5}\frac{1}{4}u^4 + C$

$g(t) = -\frac{1}{20}(5+5\cos t)^4 + C$

$g(0) = -\frac{1}{20}(5+5\cos 0)^4 + C$

$0 = -\frac{1}{20}(10^4) + C$

25. $\int 3x(x^2+7)^3\,dx =$ $\int 3x \cdot u^3 \cdot \frac{du}{2x}$ $u = x^2+7$

$\boxed{\text{A.}}$ $\frac{3}{8}(x^2+7)^4 + C$ $= \frac{3}{2}\int u^3\,du$ $\frac{du}{dx} = 2x$

B. $\frac{3}{4}(x^2+7)^4 + C$ $= \frac{3}{2}\left(\frac{1}{4}u^4\right) + C$ $\frac{du}{2x} = dx$

C. $\frac{1}{4}(x^2+7)^4 + C$ $= \frac{3}{8}(x^2+7)^4 + C$

D. $3(x^2+7)^4 + C$

E. None of these.

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26. $\int \frac{x^2}{(2x^3-12)^4}\,dx =$ $\int x^2(2x^3-12)^{-4}\,dx$ $u = 2x^3-12$

A. $-(2x^3-12)^{-3} + C$ $= \int x^2 u^{-4} \cdot \frac{du}{6x^2}$ $\frac{du}{dx} = 6x^2$

$\boxed{\text{B.}}$ $\frac{-1}{18(2x^3-12)^3} + C$ $= \frac{1}{6}\int u^{-4}\,du$ $\frac{du}{6x^2} = dx$

$= \frac{1}{6}\left(-\frac{1}{3}u^{-3}\right) + C$

C. $\frac{-1}{3(2x^3-12)^3} + C$ $= -\frac{1}{18}(2x^3-12)^{-3} + C$

D. $-\frac{1}{4}(2x^3-12)^{-3} + C$

E. None of these.

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30. $\int \sec^2 x \tan x\,dx =$ $\int \sec^2 x \cdot u \cdot \frac{du}{\sec^2 x}$ $u = \tan x$

A. $\frac{1}{3}\sec^3 x + C$ $= \int u\,du$ $\frac{du}{dx} = \sec^2 x$

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

$\boxed{\text{C.}}$ $\frac{1}{2}\tan^2 x + C$ $= \frac{1}{2}\tan^2 x + C$

D. $2\sec^2 x + C$

E. None of these.

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34. $\int \sin(4x)\sec^6(4x)\,dx =$ $\int \sin(4x)[\cos(4x)]^{-6}\,dx$ $u = \cos 4x$

A. $\frac{1}{7}\sec^7(4x) + C$ $= \int \sin 4x \cdot u^{-6} \cdot \frac{du}{-4\sin 4x}$ $\frac{du}{dx} = -\sin(4x)\cdot 4$

$\boxed{\text{B.}}$ $\frac{1}{20}\sec^5(4x) + C$ $= -\frac{1}{4}\int u^{-6}\,du$ $\frac{du}{-4\sin 4x} = dx$

C. $\frac{1}{28}\sec^7(4x) + C$ $= -\frac{1}{4}\left(-\frac{1}{5}u^{-5}\right) + C$

D. $\frac{1}{28}\sec^5(4x)\tan(4x) + C$ $= \frac{1}{20}\cos^{-5}(4x) + C = \frac{1}{20}\sec^5(4x) + C$

E. None of these.