AP Calculus BC

"Most Complicated" Rule

1) $\int (3x-4)^5 dx$

$\boxed{\frac{1}{18}(3x-4)^6 + C}$

check:

$6(3x-4)^5 \cdot 3$

2) $\int 6x^2 (x^3+4)^5 dx$

$\boxed{\frac{1}{3}(x^3+4)^6 + C}$

check

$6(x^3+4)^5 \cdot 3(x^2)$

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

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

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

check:

$3(x^{1/2}-1)^2 \cdot \frac{1}{2}x^{-1/2}$

4) $\int \sin x \, e^{\cos x} dx$

$\boxed{-e^{\cos x} + C}$

check

$e^{\cos x} \cdot (-\sin x)$

5) $\int \cot(3x) dx$

$\int \frac{\cos(3x)}{\sin(3x)} dx = \int \cos(3x)(\sin(3x))^{-1} dx$

$\boxed{\frac{1}{3}\ln|\sin(3x)| + C}$

check:

$\frac{3\cos(3x)}{\sin(3x)}$

6) $\int x^2 (1+x^3)^{-2} dx$

$\boxed{-\frac{1}{3}(1+x^3)^{-1} + C}$

check:

$-1(1+x^3)^{-2} \cdot 3x^2$

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

$\boxed{2\sin(x^{1/2}) + C}$

check:

$\cos(x^{1/2}) \cdot \frac{1}{2}x^{-1/2}$

8) $\int \sin x (1+\cos^2 x)^{-1} dx$

$\ln(1+\cos^2 x) + C$

check:

$\frac{2\cos x(-\sin x)}{1+\cos^2 x}$

→ DOES NOT WORK

LOOK FOR ANOTHER PATTERN

$\frac{d}{dx}[\arctan \square] = \frac{d\square}{1+\square^2}$

$\int \frac{\sin x}{1+\cos^2 x} dx = \boxed{-\arctan(\cos x) + C}$

9) $\int \sec^2 x (\tan x)^{-1/2} dx$

$\boxed{2(\tan x)^{1/2} + C}$

check:

$\frac{1}{2}(\tan x)^{-1/2} \cdot \sec^2 x$

10) $\int \frac{x}{\sqrt{1-x^2}}\,dx$

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

$\boxed{-(1-x^2)^{1/2}+C}$

check

$\frac{1}{2}(1-x^2)^{-1/2}(-2x)$

11) $\int (\ln x)^5 \cdot x^{-1}\,dx$

$\boxed{\frac{1}{6}(\ln x)^6+C}$

check

$6(\ln x)^5 \cdot \frac{1}{x}$

12) $\int \frac{e^x}{4-e^x}\,dx$

$\int e^x(4-e^x)^{-1}\,dx$

$\boxed{-\ln|4-e^x|+C}$

check

$\frac{-e^x}{4-e^x}$

13) $\int \frac{1}{25x^2+1}\,dx$

$\int \frac{1}{1+(5x)^2}\,dx$

$\boxed{\frac{1}{5}\arctan(5x)+C}$

14) $\int \sec(2x)\tan(2x)\,dx$

$\boxed{\frac{1}{2}\sec(2x)+C}$

15) $\int \cot x \csc^2 x\,dx$

$\boxed{-\frac{1}{2}(\cot x)^2+C}$

OR

$\int \cot x \csc x \cdot \csc x\,dx$

$\boxed{-\frac{1}{2}(\csc x)^2+C}$