

Trig, exp and log functions: answers and solutions.

1. $\tan' = (\sin/\cos)' = (\sin'\cos - \cos'\sin)/\cos^2 = (\cos^2 + \sin^2)/\cos^2 = 1/\cos^2$

2. a) $5\cos(5x)$ b) $-\sin(x^3)3x^2$

c) $3(\sin(x-2) + 3\cos(x^2))^2(\cos(x-2) - 3\sin(x^2)2x)$

d) $(1/(x^3+3))3x^2$ e) $(2x/(x^2+1))\cos(x^3) - (1+\ln(x^2+1))\sin(x^3)3x^2$

f) $10e^{10x}$ g) $\exp(x^3 + \sin(x))(3x^2 + \cos(x))$

3. $\sin(x)$ or $\cos(x)$ or $a\sin(x) + b\cos(x)$ with any constants a and b or $A\sin(x+a)$ with any constants A and a .

4. $\cos(x) + 2\sin(x)$

5. a) $(e^{5x}/5) + C$ b) $\int xe^{-x^2} dx = -(1/2) \int e^{-x^2} d(-x^2) = -e^{-x^2}/2 + C$

c) $\int \sin(x^2)d(x^2) = -\cos(x^2) + C$ d) $\ln|1+x| + C$

e) $(1/3) \int d(x^3+3)/(x^3+3) = (1/3)\ln|x^3+3| + C$

f) $\int x^3(e^x)' dx = x^3e^x - \int (x^3)'e^x dx = x^3e^x - 3 \int x^2e^x dx$, so the power of x drops by 1,

integrate by parts 2 times more to get the power of x down to 0.

g) $\int e^x e^{e^x} dx = \int e^{e^x} (e^x)' dx = \int e^{e^x} d(e^x) = e^{e^x} + C$

h) $\int x^2 \sin'(x) dx = x^2 \sin(x) - \int (x^2)' \sin(x) dx = x^2 \sin(x) - 2 \int x \sin(x) dx$

integrate by parts once more to get the power of x down to 0 ($\sin = -\cos'$).