A)

1) $\int e^{kx}\,dx = \frac{1}{k}e^{kx} + C$

2) $\int \cos kx\,dx = \frac{1}{k}\sin kx + C$

3) $\int \sin kx\,dx = -\frac{1}{k}\cos kx + C$

FOR ANY CONSTANT $k \neq 0$.

LET $u = kx$, $du = k\,dx$

B) LOG RULE

$$\int \frac{g'(x)}{g(x)}\,dx = \ln|g(x)| + C$$

LET $u = g(x)$, $du = g'(x)\,dx$

C) EXPONENTIAL RULE

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

LET $u = g(x)$, $du = g'(x)\,dx$

D) ARCTANGENT FORMULA

$$\int \frac{1}{x^2 + a^2}\,dx = \frac{1}{a}\tan^{-1}\frac{x}{a} + C$$

FOR ANY CONSTANT $a > 0$,

LET $u = \frac{x}{a}$, $x = au$, $dx = a\,du$

E) ARCSINE FORMULA

$$\int \frac{1}{\sqrt{a^2 - x^2}}\,dx = \sin^{-1}\frac{x}{a} + C$$

FOR ANY CONSTANT $a > 0$,

LET $u = \frac{x}{a}$, $x = au$, $dx = a\,du$

A) 1) $\int e^{KX}\,dx$    LET $u = KX$, so $du = K\,dx$

$= \frac{1}{K}\int e^{KX}\cdot K\,dx = \frac{1}{K}\int e^{u}\,du = \frac{1}{K}(e^{u}) + C = \boxed{\frac{1}{K}e^{KX} + C}$

3) $\int \sin KX\,dX$    LET $u = KX$, so $du = K\,dX$

$= \frac{1}{K}\int \sin KX\cdot K\,dX = \frac{1}{K}\int \sin u\,du = \frac{1}{K}(-\cos u) + C = \boxed{-\frac{1}{K}\cos KX + C}$

B) $\int \frac{g'(x)}{g(x)}\,dx$    LET $u = g(x)$, $du = g'(x)\,dX$

$= \int \frac{1}{g(x)}\cdot g'(x)\,dx = \int \frac{1}{u}\,du = \ln|u| + C = \boxed{\ln|g(x)| + C}$

C) $\int e^{g(x)}g'(x)\,dx$    LET $u = g(x)$, $du = g'(x)\,dX$

$= \int e^{u}\,du = e^{u} + C = \boxed{e^{g(x)} + C}$

D) $\int \frac{1}{x^2+a^2}\,dx$    LET $u = \frac{x}{a}$, so $X = au$ AND $dx = a\,du$

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

$= \boxed{\frac{1}{a}\tan^{-1}\frac{x}{a} + C}$

E) $\int \frac{1}{\sqrt{a^2-x^2}}\,dX$    LET $u = \frac{x}{a}$, so $X = au$ AND $dx = a\,du$

$= \int \frac{1}{\sqrt{a^2-a^2u^2}}\cdot a\,du = \int \frac{1}{\sqrt{a^2(1-u^2)}}\cdot a\,du = \int \frac{1}{\sqrt{a^2}\sqrt{1-u^2}}\cdot a\,du$    (WHERE $\sqrt{a^2} = |a| = a$ FOR $a > 0$)

$= \int \frac{1}{\sqrt{1-u^2}}\,du = \sin^{-1}u + C = \boxed{\sin^{-1}\frac{x}{a} + C}$

A) 2) $\int \cos KX\,dX$    LET $u = KX$, so $du = K\,dX$

$= \frac{1}{K}\int \cos KX\cdot K\,dX = \frac{1}{K}\int \cos u\,du = \frac{1}{K}(\sin u) + C = \boxed{\frac{1}{K}\sin KX + C}$