find y'

1. $y = \ln\sqrt{x^2+1}$
2. $y = e^{7x}$
3. $y = 5^{4x}$
4. $y = \ln\left|\frac{2x}{x^2+1}\right|$
5. $y = \log_2(x^2-1)$
6. $y = xe^{-x}$

find y'

1. $y = \ln\sqrt{x^2+1}$

   $y' = \dfrac{x}{x^2+1}$

2. $y = e^{7x}$

   $y' = 7e^{7x}$

3. $y = 5^{4x}$

   $y = \ln 5 \cdot 5^{4x} \cdot 4$

4. $y = \ln\left|\dfrac{2x}{x^2+1}\right|$

   $y' = \dfrac{1}{x} - \dfrac{2x}{x^2+1}$

5. $y = \log_2(x^2-1)$

   $y' = \dfrac{1}{\ln 2} \cdot \dfrac{2x}{x^2-1}$

6. $y = xe^{-x}$

   $y' = -e^{-x}(x-1)$

① $\int e^{-x}\,dx$

② $\int e^{4x}\,dx$

③ $\int \frac{x^2+1}{x-1}\,dx$

④ $\int \frac{x^2+1}{x}\,dx$

⑤ $\int \frac{x^3}{x^4+1}\,dx$

1. $\int e^{-x}\,dx = -e^{-x} + C$

2. $\int e^{4x}\,dx = \frac{1}{4}e^{4x} + C$

3. $\int \frac{x^2+1}{x-1}\,dx$ $\quad \frac{1}{2}x^2 + x + 2\ln|x-1| + C$

4. $\int \frac{x^2+1}{x}\,dx$ $\quad \frac{x^2}{2} + \ln|x| + C$

5. $\int \frac{x^3}{x^4+1}\,dx$ $\quad \frac{1}{4}\ln|x^4+1| + C$

17.) $\int \frac{x^3}{x^2+1}\,dx = \int \left(x + \frac{-x}{x^2+1}\right) dx$

$u = x^2+1$

$du = 2x\,dx$

$$\begin{array}{r|l} & x \\ \hline x^2+1 & x^3 \\ & -\left(x^3 + x\right) \\ \hline & -x \end{array}$$

$\frac{x^2}{2} - \frac{1}{2}\ln|x^2+1| + C$

25.) $\int_0^{1/6} \frac{3}{\sqrt{1-9x^2}}\,dx = \arcsin 3x \Big]_0^{1/6}$

$a = 1$

$u = 3x$

$du = 3dx$

$\arcsin \frac{1}{2} - 0$

$\frac{\pi}{6}$

$2x - 3$

$2x - 4 + 1$

41.) $\int \frac{2x+6-6}{x^2+6x+13}\,dx$

$x^2+6x+9+13-9$

$(x+3)^2+4$

$\int \frac{2x+6}{x^2+6x+13}\,dx - \int \frac{6}{x^2+6x+13}\,dx$

$\ln|x^2+6x+13| - 6\int \frac{dx}{(x+3)^2+4}$

$a=2$
$u=x+3$
$du=1dx$

$\ln|x^2+6x+13| - \frac{6}{2}\arctan\frac{x+3}{2}+C$

35.) $\displaystyle\int_{\pi/2}^{\pi} \frac{\sin x}{1+\cos^2 x}\,dx$

$a = 1$
$u = \cos x$
$du = -\sin x\,dx$

$$-\left(\frac{1}{1}\arctan\frac{\cos x}{1}\right)\Bigg]_{\pi/2}^{\pi}$$

$$-\left[\arctan(\cos\pi) - \arctan\left(\cos\frac{\pi}{2}\right)\right)$$

$$-\left(\frac{-\pi}{4} - 0\right)$$

$\arctan(-1)$

13.) $\int \frac{e^{2x}}{4+e^{4x}}dx$

$= \frac{1}{2}\left(\frac{1}{2}\arctan\frac{e^{2x}}{2}\right)+C$

$a=2$

$u=e^{2x}$

$du=2e^{2x}dx$

5.) $$\int \frac{2\cdot 1}{2x\sqrt{4x^2-1}}\,dx$$

$$\int \frac{du}{u\sqrt{u^2-a^2}}$$

$a=1$

$u=2x$

$du=2\,dx$

$$\frac{1}{1}\operatorname{arcsec}\frac{|2x|}{1}+C$$