15)

$$\frac{3x+5}{(x-3)(x+4)} = \frac{A}{x-3} + \frac{B}{x+4} \Rightarrow \begin{cases} A+B=3 \\ 4A-3B=5 \end{cases} \Rightarrow A=2,\ B=1$$

$$2\int_4^5\left(\frac{1}{x-3}\right)dx + \int_4^5\left(\frac{1}{x+4}\right)dx = \left[2\ln|x-3| + \ln|x+4|\right]_4^5 \qquad \textbf{D)}$$

$$= \left(2\ln 2 + \ln 9\right) - \left(2\ln 1 + \ln 8\right) = \ln 36 - \ln 8 = \ln\frac{9}{2}$$

16) Which of these indefinite integral requires the method of REPEATED integration by parts?

D) $\int e^{2x}\cos 3x\,dx$ \

17)

$$\int \frac{x}{\sqrt{4-x^2}}dx \quad + \quad \int \frac{2}{\sqrt{4-x^2}}dx \quad \int \frac{2}{\sqrt{4-x^2}}dx = \int \frac{2}{\sqrt{4\left(1-\frac{x^2}{4}\right)}}dx = \int \frac{2}{2\sqrt{\left(1-\frac{x^2}{4}\right)}}dx$$

$u = 4-x^2,\ du = -2xdx$ **B)**

$$-\frac{1}{2}\int \frac{du}{\sqrt{u}} + \int \frac{1}{\sqrt{1-\left(\frac{x}{2}\right)^2}}dx = -\frac{1}{2}\left(2\sqrt{u}\right) + 2\sin^{-1}\left(\frac{x}{2}\right) + C = -\sqrt{4-x^2} + 2\sin^{-1}\left(\frac{x}{2}\right) + C$$

18) $\int_{-\infty}^{\infty}\frac{dx}{x^2+1} =$ **C)**

A) 0 B) π/2 C) π D) 2π E) N.O.T.

19) $\int_2^4 \frac{dx}{(x-3)^{2/3}}$

$$\left.\frac{(x-3)^{1/3}}{1/3}\right|_2^4 = 3-(-3) = 6 \qquad \textbf{A)}$$

20) Which of the following improper integrals diverges? **D)**

$$\lim_{a\to 0}\int_{-1}^{a}\frac{dx}{x^2} + \lim_{b\to 0}\int_b^1\frac{dx}{x^2}$$

$$\lim_{a\to 0^-}\left[-\frac{1}{x}\right]_{-1}^{a} + \lim_{b\to 0^+}\left[-\frac{1}{x}\right]_b^1 = \lim_{a\to 0^-}\left[-\frac{1}{a}+1\right]_{-1}^{a} + \lim_{b\to 0^+}\left[-1+\frac{1}{b}\right]_b^1 = \infty+\infty = \infty$$

23) C) $\pi\int_{-2}^{2}\left[\left(k-x^2\right)^2-\left(k-4\right)^2\right]dx$