WARMUP

Copy these formulas into your notes:

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^x\,dx = e^x + C$$

$$\int a^x\,dx = \frac{a^x}{\ln a} + C$$

$$\int \sin x\,dx = -\cos x + C$$

$$\int \cos x\,dx = \sin x + C$$

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

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ex: $\int_0^2 \left(\frac{x^3}{3} + 2x\right) dx = \int_0^2 \left(\frac{1}{3}x^3 + 2x\right) dx$

Definite Integral

$$= \frac{1}{3}\cdot\frac{x^4}{4} + \frac{2x^2}{2}$$

$$= \left[\frac{x^4}{12} + x^2\right]_0^2$$

$$= \left[\frac{2^4}{12} + 2^2\right] - \left[\frac{0^4}{12} + 0^2\right]$$

$F(b) \quad - \quad F(a)$

$$= \frac{16}{12} + 4 - 0$$

$$= \frac{4}{3} + \frac{12}{3} = \boxed{\frac{16}{3}}$$

$$\int 5e^x\,dx = 5\int e^x\,dx = 5e^x + C$$

$$\int ke^x\,dx = ke^x + C$$

$$\int 10\sin x\,dx = 10(-\cos x) + C$$

$$= -10\cos x + C$$

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5, 7, 11, 15, 16, 18, 20, 28, 30, 44, 51, 52, 56, 60, 61, 63, 67, 69

56) $$\int \left(t\sqrt{t} + \frac{1}{t\sqrt{t}}\right)dt = \int \left(t\cdot t^{\frac{1}{2}} + \frac{1}{t\cdot t^{\frac{1}{2}}}\right)dt$$

$$= \int \left(t^{3/2} + \frac{1}{t^{3/2}}\right)dt$$

$$= \int \left(t^{3/2} + t^{-3/2}\right)dt$$

$$= \frac{t^{5/2}}{5/2} + \frac{t^{-1/2}}{-1/2} + C$$

$$= \frac{2}{5}t^{5/2} - 2t^{-1/2} + C$$

$$= \frac{2}{5}\sqrt{t^5} - \frac{2}{\sqrt{t}} + C$$

$\int kf(x)\,dx = k\int f(x)\,dx$

$\frac{d}{dt}\left(e^{5t}\right) = 5e^{5t}$

$\frac{d}{dt}\left(5e^{5t}\right) = 5e^{5t}\cdot 5 = 25e^{5t}$

18) $\int (e^t + 5e^{5t})\,dt = e^t + e^{5t} + C$

60) $\int \left(\frac{y^2-1}{y}\right)^2 dy = \int \left(\frac{y^2}{y} - \frac{1}{y}\right)^2 dy = \int \left(y - \frac{1}{y}\right)^2 dy$

$= \int (y^2 - 2 + y^{-2})\,dy$

$= \frac{y^3}{3} - 2y + \frac{y^{-1}}{-1} + C$

$= \frac{y^3}{3} - 2y - \frac{1}{y} + C$

$(y - \frac{1}{y})(y - \frac{1}{y})$

$y^2 - 1 - 1 + \frac{1}{y^2}$