$\int \sec^2 x = \tan x + C$

$\int \sec x \tan x = \sec x + C$

Calculus 1 $\int \csc x \cot x = -\csc x + C$

Name_____

$\int \csc^2 x = -\cot x + C$

Worksheet - Integration (C)

Date_____

1) $\int \left(\frac{3}{x^5} + \frac{8}{\sqrt[6]{x^5}} - \frac{1}{x^2} \right) dx$

$\int (3x^{-5} + 8x^{-5/6} - x^{-2})\, dx$

$\frac{3x^{-4}}{-4} + 8 \cdot 6 x^{1/6} + x^{-1} + C$

$-\frac{3}{4}x^{-4} + 48x^{1/6} + x^{-1} + C$

2) $\int y^3 \left(\sqrt{y} + \frac{1}{\sqrt[4]{y}} + \sqrt[5]{y^2} \right) dy$

$\int y^3 (y^{1/2} + y^{-1/4} + y^{2/5})\, dy$

$\int (y^{7/2} + y^{11/4} + y^{17/5})\, dy$

$\frac{2}{9} y^{9/2} + \frac{4}{15} y^{15/4} + \frac{5}{22} y^{22/5} + C$

3) $\int \frac{3t^7 - 5t^4 + 9t - 7}{t^3}\, dt$

$\int (3t^4 - 5t + 9t^{-2} - 7t^{-3})\, dt$

$\frac{3t^5}{5} - \frac{5}{2}t^2 - 9t^{-1} + \frac{7}{2}t^{-2} + C$

4) $\int \frac{x^3 + 5x^2 - 6x + 1}{\sqrt[3]{x^2}}\, dx$

$\int x^{-2/3} (x^3 + 5x^2 - 6x + 1)\, dx$

$\int (x^{7/3} + 5x^{4/3} - 6x^{1/3} + x^{-2/3})\, dx$

$\frac{3}{10}x^{10/3} + \frac{15}{7}x^{7/3} - \frac{9}{2}x^{4/3} + 3x^{1/3} + C$

5) $\int (\cos\theta + 5\sin\theta)\, d\theta$

$\sin\theta - 5\cos\theta + C$

6) $\int (\sec^2\theta + \csc^2\theta)\, d\theta$

$\tan\theta + -\cot\theta + C$

7) $\int\left(7\sec x\tan x+\frac{3x}{\sqrt[7]{x^4}}-\frac{1}{\sqrt[4]{x^3}}+2\right)dx$

$3x\cdot x^{-4/7}$ $\quad 3x^{3/7}$ $\quad x^{-3/4}$

$7\sec x+\frac{21}{10}x^{10/7}-4x^{1/4}+2x+C$

8) $\int x^4\left(\frac{3}{x^3}+\frac{3x}{x^{1/2}}+5x^4-2x^{-4}\right)dx$

$\int x^4\left(3x^{-3}+3x^{1/2}+5x^4-2x^{-4}\right)dx$

$\int\left(3x+3x^{9/2}+5x^8-2\right)dx$

$\frac{3}{2}x^2+\frac{6}{11}x^{11/2}+\frac{5}{9}x^9-2x+C$

9) $\int\left(\frac{x^2\sin x-3x^5+\sqrt[6]{x^5}+\frac{1}{\sqrt[3]{x}}}{x^2}\right)dx$

$x^{5/6}$ $\quad x^{-1/3}$

$\int\left(\sin x-3x^3+x^{-7/6}+x^{-7/3}\right)dx$

$-\cos x-\frac{3}{4}x^4-6x^{-1/6}-\frac{3}{4}x^{-4/3}+C$

10) $\int(x+4)^3\,dx$

$\int(x^2+8x+16)(x+4)\,dx$

$\int(x^3+12x^2+48x+64)dx$

$\frac{1}{4}x^4+4x^3+24x^2+64x+C$

11) $\int\left(\frac{12}{x^4}-16x^7+\cot x\csc x+5\sqrt[3]{x^2}\right)dx$

$-4x^{-3}-2x^8-\csc x+3x^{5/3}+C$

12) $\int\left(\frac{(x^2-6x)^2}{x^{3/8}}\right)dx$

$\int(x^4-12x^3+36x^2)x^{-3/8}\,dx$

$\int\left(x^{29/8}-12x^{21/8}+36x^{13/8}\right)dx$

$\frac{8}{37}x^{37/8}-\frac{96}{29}x^{29/8}+\frac{96}{7}x^{21/8}+C$

13) $\int dy = \int (x^2+1)\,dx$

$y = \frac{1}{3}x^3 + x + c$

$1 = \frac{1}{3}(1)^3 + 1 + c$

$1 = \frac{4}{3} + c$

$-\frac{1}{3} = c$

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

14) $\int ds = \int (16t^2 + 4t - 1)\,dt$

$s = \frac{16}{3}t^3 + 2t^2 - t + c$

$100 = \frac{16}{3}(0)^3 + 2(0)^2 - 0 + c$

$100 = c$

$s = \frac{16}{3}t^3 + 2t^2 - t + 100$

15) $\frac{dy}{dx} = y^4$

$\frac{dy}{y^4} = \frac{y^4\,dx}{y^4}$

$\int y^{-4}\,dy = \int dx$

$-\frac{1}{3}y^{-3} = x + c$

$-\frac{1}{3}(1)^{-3} = 0 + c$

$-\frac{1}{3} = c$

$-\frac{1}{3}y^{-3} = x - \frac{1}{3}$

16. $\int y\,dy = \int x\,dx$

$\frac{1}{2}y^2 = \frac{1}{2}x^2 + c$

$\frac{1}{2}(1)^2 = \frac{1}{2}(1)^2 + c$

$\frac{1}{2} = \frac{1}{2} + c$

$0 = c$

$\frac{1}{2}y^2 = \frac{1}{2}x^2$

17. $\frac{dy}{dx} = \sqrt{\frac{x}{y}}$

$\frac{dy}{dx} = \frac{x^{1/2}}{y^{1/2}}$

$\int y^{\frac{1}{2}}\,dy = \int x^{1/2}\,dx$

$\frac{2}{3}y^{3/2} = \frac{2}{3}x^{3/2} + c$

$\frac{2}{3}(4)^{3/2} = \frac{2}{3}(1)^{3/2} + c$

$\frac{16}{3} = \frac{2}{3} + c$

$\frac{14}{3} = c$

$\boxed{\frac{2}{3}y^{3/2} = \frac{2}{3}x^{3/2} + \frac{14}{3}}$

18. $\frac{dy}{dx} = y^3(x^3 - x)$

$dy = y^3(x^3 - x)\,dx$

$\int y^{-3}\,dy = \int (x^3 - x)\,dx$

$-\frac{1}{2}y^{-2} = \frac{1}{4}x^4 - \frac{1}{2}x^2 + c$

$-\frac{1}{2}(4)^{-2} = \frac{1}{4}(0)^4 - \frac{1}{2}(0)^2 + c$

$-\frac{1}{32} = c$

$\boxed{-\frac{1}{2}y^{-2} = \frac{1}{4}x^4 - \frac{1}{2}x^2 - \frac{1}{32}}$