Calculus 1   Name_____

Review: Integration and Solving for C   Date_____

Integrate the following. Make sure you show all your work.

1) $\int\left(4x^3 + \sqrt{3}x^2 - 6\right)dx$

$$x^4 + \frac{\sqrt{3}}{3}x^3 - 6x + c$$

2) $\int\left(3\sec^2 x + 4x\right)dx$

$$3\tan x + 2x^2 + c$$

3) $\int\left(3x^{1/3} + \frac{\sqrt{5x}}{x}\right)dx$

$\frac{\sqrt{5}x^{1/2}}{x} \qquad \sqrt{5}x^{-1/2}$

$$\frac{9}{4}x^{4/3} + 2\sqrt{5}\,x^{1/2} + c$$

4) $\int\left(\frac{4}{x^5} + \sqrt[2]{x^5} - 4\cos x\right)dx$

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

$$-x^{-4} + \frac{2}{7}x^{7/2} - 4\sin x + c$$

5) $\int\left(\frac{(x+2)^2}{\sqrt{x}}\right)dx$

$$\int \frac{x^2+4x+4}{x^{1/2}}\,dx$$

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

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

$$\frac{2}{5}x^{5/2} + \frac{8}{3}x^{3/2} + 8x^{1/2} + c$$

6) $\int dx$

$$x + c$$

Solve for the constant of integration. (5 points each)

7) $\int dy = \int (2x^2 + 4x - 7)dx$ through $(3,3)$

$y = \frac{2}{3}x^3 + 2x^2 - 7x + c$

$3 = \frac{2}{3}(3)^3 + 2(3)^2 - 7(3) + c$

$-12 = c$

$y = \frac{2}{3}x^3 + 2x^2 - 7x - 12$

8) $\frac{dy}{dx} = \frac{5x^2}{y}$ where $f(1) = 2$

$y\,dy = 5x^2\,dx$

$\int y\,dy = \int 5x^2\,dx$

$\frac{1}{2}y^2 = \frac{5}{3}x^3 + c$

$\frac{1}{2}(2)^2 = \frac{5}{3}(1)^3 + c$

$2 = \frac{5}{3} + c$

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

$\frac{1}{2}y^2 = \frac{5}{3}x^3 + \frac{1}{3}$

9) $\frac{dy}{dx} = \frac{5}{\sqrt{x}}$ through $(4,6)$

$dy = 5x^{-\frac{1}{2}}\,dx$

$\int dy = \int 5x^{-\frac{1}{2}}\,dx$

$y = 10x^{\frac{1}{2}} + c$

$6 = 10(4)^{\frac{1}{2}} + c$

$6 = 20 + c$

$-14 = c$

$y = 10x^{\frac{1}{2}} - 14$

10) $\frac{dy}{dx} = \frac{x}{\sqrt{y}}$ where $f(2) = 1$

$\sqrt{y}\,dy = x\,dx$

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

$\frac{2}{3}y^{\frac{3}{2}} = \frac{1}{2}x^2 + c$

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

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

$-\frac{4}{3} = c$

$\frac{2}{3}y^{\frac{3}{2}} = \frac{1}{2}x^2 - \frac{4}{3}$