

Name _____

Justify all answers by showing your work or by providing a coherent explanation. Please circle your answers.

1. $\int \frac{3x^2 + 2x + 7}{x^2 + 1} dx =$

2. $\int \frac{dx}{5x^2 - 10x + 25} =$

3. $\int_0^{16} \frac{\sqrt[4]{x}}{1 + \sqrt{x}} dx =$

4. $\int x^2 \ln 3x dx =$

5. $\int \frac{x}{x^2 - 4} dx =$

6. $\int \frac{7x}{x^3 - x^2} dx =$

$$7. \int \frac{\sqrt[3]{x-8}}{x} dx =$$

$$8. \int \frac{2}{x-3\sqrt{x+10}} dx =$$

$$9. \int \ln \sqrt{3x-4} \, dx =$$

$$10. \int_0^3 \frac{dx}{(x+2)\sqrt{x+1}} =$$

$$11. \int \sin^3 x \, dx =$$

$$12. \int \sqrt{\sin x} \cos^3 x \, dx = \left(\text{Remember : } \sqrt{\sin x} = \sin^{\frac{1}{2}} x \right)$$

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$$1. \int \frac{1}{x\sqrt{x^2 + 1}} dx =$$

$$2. \int \frac{\sqrt{16 - t^2}}{t^2} dt =$$

$$3. \int_1^5 \frac{x dx}{\sqrt{5 - x}} =$$

$$4. \int_0^{+\infty} \frac{dx}{x^2 + 1} =$$

$$5. \int_0^1 \frac{x^2}{\sqrt{1 - x^2}} dx =$$

$$6. \int_1^{+\infty} \frac{1}{(1 + x)^{\frac{3}{2}}} dx =$$

$$7. \int_{-\infty}^{+\infty} \frac{dx}{x^2 + 2x + 2} =$$

$$8. \int_0^6 \frac{2x}{(x^2 - 4)^{\frac{2}{3}}} dx =$$

Solve the following differential equations for y.

$$9. \quad xy \, dx = (1 + x^2) \, dy$$

$$10. \quad \frac{dy}{dx} - y = -2e^{-x}$$

$$11. \quad x \frac{dy}{dx} - 2y + 3x = 0$$

$$12. \quad \frac{dy}{dx} + \frac{y}{x} = \cos x + \frac{\sin x}{x}$$

$$13. \quad \frac{dx}{y} + \frac{4 \, dy}{x} = 0; \quad y(4) = 2$$

$$14. \quad dy + y \tan x \, dx = 0$$

$$15. \quad y' - \frac{y^2}{1 - x} = 0$$

$$16. \quad \frac{dy}{dx} = \frac{1 + y^2}{1 + x^2}$$

$$\left(\begin{array}{l} \text{Remember :} \\ \tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y} \end{array} \right)$$