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1.1. $\int \frac{4x^3 - \sqrt{x} + 4}{\sqrt{x}} dx = \int \left(\frac{4x^3}{\sqrt{x}} - 1 + \frac{4}{\sqrt{x}}\right) dx = \int \frac{4x^3}{\sqrt{x}} dx - \int 1 dx + \int \frac{4}{\sqrt{x}} dx =$

$= \frac{8x^3\sqrt{x}}{7} - x + 8\sqrt{x} + C.$

2.1. $\int \sqrt{3+x}\, dx = \frac{2(3+x)\sqrt{3+x}}{3} + C.$

3.1. $\int \frac{dx}{3-x} = -\ln|3-x| + C.$

4.1. $\int \sin(2-3x)\, dx = \frac{\cos(2-3x)}{3} + C.$

5.1. $\int \frac{2x}{\sqrt{5-4x^2}} dx = 2\int \frac{x}{\sqrt{5-4x^2}} dx = -\frac{1}{2}\sqrt{5-4x^2} + C.$

6.1. $\int \frac{1}{\sqrt{2-5x^2}} dx = \int \frac{1}{\sqrt{5}\left(\sqrt{\frac{2}{5}-x^2}\right)} dx = \frac{1}{\sqrt{5}} \cdot \arcsin\left(\frac{x}{\sqrt{\frac{2}{5}}}\right) = \frac{\sqrt{5}\cdot \arcsin\left(\frac{\sqrt{10}x}{2}\right)}{5} + C$

7.1. $\int e^{2x-7} dx = \frac{e^{2x-7}}{2} + C.$

8.1. $\int \frac{dx}{(2x+1)\sqrt[3]{\ln^2(2x+1)}} = \left| \begin{matrix} \ln(2x+1) = t \\ \frac{1}{2x+1} dx = dt \end{matrix} \right| = \int \frac{dt}{t^{\frac{2}{3}}} = 3\sqrt[3]{t} + C =$

$= 3\sqrt[3]{\ln(2x+1)} + C.$

9.1. $\displaystyle\int \frac{\sqrt{tg^3 x}}{\cos^2 x}\,dx = \left| \begin{array}{l} tg\,x = t \\ \frac{1}{\cos^2 x}\,dx = dt \end{array} \right| = \int \sqrt{t^3}\,dt =$

$\displaystyle = \frac{2\sqrt{t^5}}{5} = \frac{2\cdot\sqrt{tg^5 x}}{5.} + C$

10.1. $\displaystyle\int \frac{\sqrt{arctg^6 3x}}{1+9x^2}\,dx = \left| \begin{array}{l} arctg\,3x = t \\ \frac{3}{1+9x^2}\,dx = dt. \end{array} \right| = \int \frac{1}{3}\cdot\sqrt{t^6}\,dt =$

$\displaystyle = \frac{t^4}{12} = \frac{arctg^4 3x}{12} + C.$

11.1. $\displaystyle\int_1^{\sqrt{2}} \frac{\sqrt{4-x^2}}{x^2}\,dx = \left| \begin{array}{ll} u = \sqrt{4-x^2} & du = \frac{1}{2\sqrt{4-x^2}}\cdot(-2x)\,dx \\ dv = \frac{1}{x^2}\,dx & v = -\frac{1}{x} \end{array} \right| =$

$\displaystyle = \sqrt{4-x^2}\cdot\left(-\frac{1}{x}\right) - \int_1^{\sqrt{2}} -\frac{1}{x}\cdot\frac{1}{2\sqrt{4-x^2}}\cdot(-2x)\,dx =$

$\displaystyle = -\frac{\sqrt{4-x^2}}{x} - \int_1^{\sqrt{2}} \frac{1}{\sqrt{4-x^2}}\,dx = -\frac{\sqrt{4-x^2}}{x} - \arcsin\left(\frac{x}{2}\right)\Bigg|_1^{\sqrt{2}} =$

$\displaystyle = -1 - \frac{\pi}{4} + 2 + \frac{\pi}{6} = 1 - \frac{\pi}{12}.$

12. 1) $r = 4 \cdot \sin^2\varphi$ $\quad S = \frac{1}{2}\int r^2 d\varphi$

$$S = \frac{1}{2} \cdot 4 \int \sin^4\varphi \, d\varphi = 2 \cdot \int \left(\frac{1-\cos(2\varphi)}{2} \right)^2 d\varphi =$$

$$= 2 \cdot \int \frac{1 - 2\cdot\cos(2\varphi) + \cos^2(2\varphi)}{4} d\varphi =$$

$$= \frac{3}{4}\varphi - \frac{\sin(2\varphi)}{2} + \frac{\sin(4\varphi)}{16}.$$

13. 1. $r = 5(1+\cos\varphi).$ $\quad l = \int \sqrt{r^2 + (r')^2} \, d\varphi =$

$$l = \int \sqrt{25(1+\cos\varphi)^2 + (-5\sin\varphi)^2} \cdot d\varphi =$$

$$= 5\int \sqrt{2(1+\cos\varphi)} \, d\varphi = 5\int \sqrt{2 \cdot 2 \cdot \cos^2\frac{\varphi}{2}} \, d\varphi =$$

$$= 10\int \cos\frac{\varphi}{2} \, d\varphi = 20 \sin\frac{\varphi}{2}.$$

14. 1. $y = \sqrt{x^3}$ $\quad x = 0 \quad y = 4.$

$$V = \pi \int_4^0 y^2 dx = \pi \int_4^0 x^3 dx = \pi \cdot \frac{x^4}{4}\Big|_4^0 =$$

$$= \pi\left(0 - \frac{4^4}{4}\right) = -64\pi.$$

15.1. $\displaystyle\int_0^\infty \frac{x}{16x^2+1}\,dx = \lim_{b\to\infty}\int_0^b f(x)\,dx =$

$\displaystyle = \lim_{b\to\infty}\int_0^b \frac{x}{16x^2+1}\,dx = \lim_{b\to\infty}\left(\frac{1}{32}\cdot\ln(16x^2+1)\right)\Big/_0^b =$

$= \infty.$