1. $\displaystyle\int (x+1)e^{2x}\ \mathbf{d}x = \left|\begin{array}{ll} u = x+1 & \mathbf{d}u = \ \mathbf{d}x \\ \mathbf{d}v = e^{2x}\ \mathbf{d}x & v = \frac{1}{2}e^{2x} \end{array}\right| = \frac{1}{2}(x+1)e^{2x} - \int \frac{1}{2}e^{2x}\ \mathbf{d}x =$

$\displaystyle = \frac{1}{2}(x+1)e^{2x} - \frac{1}{4}e^{2x} + c$

2. $\displaystyle\int \cos(\ln x)\cdot\frac{1}{x}\ \mathbf{d}x = \left|\ t = \ln x \quad \mathbf{d}t = x\ \mathbf{d}x\ \right| = \int \cos t\ \mathbf{d}t = \sin t = \sin(\ln x) + c$

3. $\displaystyle\int \frac{2x}{x^2+1} = \int \frac{1}{x^2+1}\ \mathbf{d}(x^2+1) = \ln|x^2+1| + c$

4. $\displaystyle\int \sin^2 x\cos^2 x\ \mathbf{d}x = \frac{1}{4}\int \sin^2 2x\ \mathbf{d}x = \frac{1}{8}\int (1-\cos 4x) = \frac{1}{8}\left(x - \frac{1}{4}\sin 4x\right) + c$

5. $\displaystyle\int \frac{\mathbf{d}x}{1+\sin x+\cos x} = |\tan\frac{x}{2} = t| = \int \frac{2\ \mathbf{d}t}{1+t^2}\cdot\frac{1}{1+\frac{2t}{1+t^2}+\frac{1-t^2}{1+t^2}} = \int \frac{\mathbf{d}t}{1+t} =$

$\displaystyle = \ln|t+1| = \ln|\tan\frac{x}{2}+1| + c$

6. $\displaystyle\int \frac{x-2}{x^2-7x+12}\ \mathbf{d}x = \int \frac{x-2}{(x-3)(x-4)}\ \mathbf{d}x = \int\left(\frac{A}{x-3}+\frac{B}{x-4}\right)\ \mathbf{d}x =$

$\displaystyle A = \left.\frac{x-2}{x-4}\right|_{x=3} = -1$

$\displaystyle B = \left.\frac{x-2}{x-3}\right|_{x=4} = 2$

$\displaystyle = \int\left(-\frac{1}{x-3}+\frac{2}{x-4}\right)\ \mathbf{d}x = -\ln|x-3| + 2\ln|x-4| + c$

7. $\displaystyle\int \frac{x\ \mathbf{d}x}{\sqrt[3]{x+1}} = \int x(x+1)^{-\frac{1}{3}}\ \mathbf{d}x = \left|\begin{array}{lll} m=1 & n=1 & \frac{m+1}{n} = 2 \\ t^3 = x+1 & x = t^3-1 & \mathbf{d}x = 3t^2\ \mathbf{d}t \end{array}\right| =$

$\displaystyle = \int \frac{3t^2(t^3-1)\ \mathbf{d}t}{t} = 3\int\left(t^4-t\right)\ \mathbf{d}t = 3\left(\frac{t^5}{5}-\frac{t^2}{2}\right) = 3\left(\frac{\sqrt[3]{x+1}^5}{5} - \frac{\sqrt[3]{x+1}^2}{2}\right)$

8. $\displaystyle\int \frac{x^3}{(1-4x^2)^{\frac{3}{2}}}\ \mathbf{d}x = \left|\begin{array}{l} t^2 = 1-4x^2 \\ x = \frac{1}{4}\sqrt{1-t^2} \\ \mathbf{d}x = -\frac{1}{2}\cdot\frac{t}{\sqrt{1-t^2}} \end{array}\right| = \int \frac{t^2-1}{16t^2}\ \mathbf{d}t = \frac{1}{16}\int\left(1-\frac{1}{t^2}\right) =$

$\displaystyle = \frac{1}{16}\left(t+\frac{1}{t}\right) = \frac{1}{16}\left(\sqrt{1-4x^2}+\frac{1}{\sqrt{1-4x^2}}\right) + c$

9. $\displaystyle\int_0^1 \frac{x}{x^4+1}\ \mathbf{d}x = \left|\begin{array}{l} t = x^2 \\ x = \sqrt{t} \\ \mathbf{d}x = \frac{\mathbf{d}t}{2\sqrt{x}} \end{array}\right| = \frac{1}{2}\int_0^1 \frac{\mathbf{d}t}{(t^2+1)} = \frac{1}{2}\arctan t\Big|_0^1 = \frac{1}{2}\arctan x^2\Big|_0^1 = \frac{\pi}{8}$

10. $\displaystyle\begin{cases} y = \sqrt{x} \\ y = 0 \\ x = 4 \end{cases} \Rightarrow x_1 = 0,\ x_2 = 4$

$\displaystyle S = \int_0^4 \left(\sqrt{x}\right)\ \mathbf{d}x = \frac{16}{3}$

11. $l = \int\limits_0^{11} \sqrt{1 + (f'(x))^2}\ \mathbf{d}x = \int\limits_0^{11} \sqrt{1 + (3\sqrt{x})^2}\ \mathbf{d}x = \int\limits_0^{11} \sqrt{1 + 9x}\ \mathbf{d}x = \frac{1}{9} \int\limits_0^{11} \sqrt{1 + 9x}\ \mathbf{d}(1+9x) =$

$= \frac{2}{27}\sqrt{1+9x}|1+9x|\Big|_0^{11} = 74$