D 5.1.

1. $\int \frac{1}{\sqrt[3]{x}} dx = \int x^{-\frac{1}{3}} dx = \frac{x^{\frac{2}{3}}}{\frac{2}{3}} = \frac{3}{2} x^{\frac{2}{3}} + C$

2. $\int 3x^{-1} dx = 3 \int x^{-1} dx = 3 \ln|x| + C$

3. $\int \frac{3}{2x} dx = \frac{3}{2} \int \frac{1}{x} dx = \frac{3}{2} \ln|x| + C$

4. $\int x^{-5} dx = \frac{x^{-4}}{-4} = -\frac{1}{4x^4}$

5. $\int \frac{3 + e^{x} \sin x}{e^{x}} dx = \int \frac{3}{e^{x}} + \frac{e^{x} \sin x}{e^{x}} dx = \int 3e^{x} + \sin x \, dx = 3e^{x} - \cos x + C$

6. $\int \frac{3x^2+1}{x^3+x+2} dx = \ln|x^3+x+2| + C$

7. $\int \left(\sin x - \frac{1}{\cos^2 x}\right) dx = -\cos x - \tan x + C$

8. $\int \sqrt{x}(1-x^2) dx = \int x^{\frac{1}{2}}(1-x^2) dx = \int x^{\frac{1}{2}} - x^{\frac{5}{2}} dx = \frac{x^{\frac{3}{2}}}{\frac{3}{2}} - \frac{x^{\frac{7}{2}}}{\frac{7}{2}} = \frac{2}{3} x^{\frac{3}{2}} - \frac{2}{7} x^{\frac{7}{2}}$

9. $\int x^3 - 3x^2 + 4x - 7 \, dx = \frac{x^4}{4} - x^3 + 2x^2 - 7x + C$

10. $\int \frac{1}{2} \sqrt{e^x} dx = \frac{1}{2} \int (e^x)^{\frac{1}{2}} dx = \frac{1}{2} \int e^{\frac{x}{2}} dx = \frac{1}{2} \cdot \frac{e^{\frac{x}{2}}}{\frac{1}{2}} = e^{\frac{x}{2}} = \sqrt{e^x}$

11. $\int \left(\frac{1-x}{x}\right)^2 dx = \int \left(\frac{1}{x} - 1\right)^2 dx = \int \frac{1}{x^2} - \frac{2}{x} + 1 \, dx = \int x^{-2} - 2x^{-1} + 1 \, dx = -\frac{1}{x} - 2\ln|x| + x + C$

12. $\int 3\sqrt[5]{x} - 7x \, dx = \int 3x^{\frac{1}{5}} - 7x \, dx = 3 \cdot \frac{x^{\frac{6}{5}}}{\frac{6}{5}} - 7\frac{x^2}{2} = \frac{5}{2} x^{\frac{6}{5}} - \frac{7}{2} x^2 + C$

13. $\int \frac{2-x^2}{x+\sqrt{2}} dx = \int \frac{(\sqrt{2}-x)(\sqrt{2}+x)}{\sqrt{2}+x} dx = \int \sqrt{2} - x \, dx = \sqrt{2}x - \frac{x^2}{2} + C$

5.2.

1. $\int \frac{2\ln x}{x} dx = 2\int \frac{\ln x}{x} dx = \left| \begin{array}{l} t = \ln x \\ dt = \frac{1}{x} dx \end{array} \right| = 2\int t \, dt = 2 \cdot \frac{t^2}{2} = t^2 = \ln^2 x + C$

2. $\int \sqrt{2x-5} \, dx = \left| \begin{array}{l} t = 2x-5 \\ dt = 2\,dx \end{array} \right| = \int \sqrt{t} \, \frac{dt}{2} = \frac{1}{2} \int t^{\frac{1}{2}} dt = \frac{1}{2} \frac{t^{\frac{3}{2}}}{\frac{3}{2}} = \frac{1}{3} t^{\frac{3}{2}} = \frac{1}{3}(2x-5)^{\frac{3}{2}} + C$

3. $\int \frac{4x}{\sqrt[3]{8-x^2}} dx = \left| \begin{array}{l} 8 - x^2 = t \\ -2x\,dx = dt \\ x\,dx = dt/-2 \end{array} \right| = \int \frac{4 \cdot \frac{dt}{-2}}{\sqrt[3]{t}} = -2 \int t^{-\frac{1}{3}} dt = -2 \frac{t^{\frac{2}{3}}}{\frac{2}{3}} = -3t^{\frac{2}{3}} = -3(8-x^2)^{\frac{2}{3}} + C$

4. $\int \frac{e^{\frac{x}{2}} - e^{-\frac{x}{2}}}{2} dx = \left| \begin{array}{l} \frac{x}{2} = t \\ \frac{1}{2} dx = dt \end{array} \right| = \int e^{t} - e^{-t} dt = e^{t} + e^{-t} = e^{\frac{x}{2}} + e^{-\frac{x}{2}} + C$

5. $\int \frac{1}{\cos^2 8x} dx = \left| \begin{array}{l} 8x = t \\ 8\,dx = dt \\ dx = \frac{1}{8} dt \end{array} \right| = \int \frac{1}{\cos^2 t} \cdot \frac{1}{8} \cdot dt = \frac{1}{8} \tan t = \frac{1}{8} \tan 8x + C$

6. $\int \frac{12}{(3x-7)^5}dx = \left|\begin{matrix} 3x-7=t \\ 3dx=dt \end{matrix}\right| = \int \frac{4\,dt}{t^5} = 4\int t^{-5}dt = 4\,\frac{t^{-4}}{-4} = -\frac{1}{t^4} = -\frac{1}{(3x-7)^4}+C$

7. $\int \frac{x}{x^2-1}dx = \left|\begin{matrix} x^2-1=t \\ 2x\,dx=dt \\ x\,dx=dt/2 \end{matrix}\right| = \int \frac{1}{t}\cdot\frac{dt}{2} = \frac{1}{2}\int t^{-1}dt = \frac{1}{2}\ln|t| = \frac{1}{2}\ln|x^2-1|+C$

8. $\int \frac{4\tan^3 x}{\cos^2 x}dx = \left|\begin{matrix} \tan x = t \\ \frac{1}{\cos^2 x}dx = dt \end{matrix}\right| = 4\int t^3\,dt = 4\,\frac{t^4}{4} = \tan^4 x + C$

9. $\int 2e^{2\sin x}\cos x\,dx = \left|\begin{matrix} 2\sin x = t \\ 2\cos x\,dx = dt \end{matrix}\right| = \int e^t\,dt = e^t = e^{2\sin x}+C$

10. $\int \frac{2x}{(1+x^2)^2}dx = \left|\begin{matrix} 1+x^2=t \\ 2x\,dx=dt \end{matrix}\right| = \int \frac{dt}{t^2} = \int t^{-2}dt = \frac{t^{-1}}{-1} = -\frac{1}{t} = -\frac{1}{1+x^2}+C$

11. $\int 4\sin x\cos^3 x\,dx = \left|\begin{matrix} \cos x = t \\ -\sin x\,dx = dt \\ \sin x\,dx = -dt \end{matrix}\right| = 4\int t^3\cdot(-dt) = -4\cdot\frac{t^4}{4} = -t^4 = -\cos^4 x + C$

5.3.

1. $\int_1^2 x^2dx = \left[\frac{x^3}{3}\right]_1^2 = \frac{2^3}{3} - \frac{1^3}{3} = \frac{8}{3} - \frac{1}{3} = \frac{7}{3}$

2. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} 2\sin^2 2x\,dx = \left|\begin{matrix} 2x=t \\ 2dx=dt \\ -\frac{\pi}{2}\to-\pi \\ \frac{\pi}{2}\to\pi \end{matrix}\right| = \int_{-\pi}^{\pi}\sin^2 t\,dt = \int_{-\pi}^{\pi}\frac{1-\cos 2t}{2}dt = \frac{1}{2}\int_{-\pi}^{\pi}1-\cos 2t\,dt = \left|\begin{matrix} 2t=w \\ 2dt=dw \\ -\pi\to-2\pi \\ \pi\to2\pi \end{matrix}\right|$

$= \frac{1}{2}\int_{-2\pi}^{2\pi}1-\cos w\,\frac{dw}{2} = \frac{1}{4}\left[w-\sin w\right]_{-2\pi}^{2\pi} = \frac{1}{4}\left((2\pi-\sin(2\pi))-(-2\pi-\sin(-2\pi))\right) = \pi$

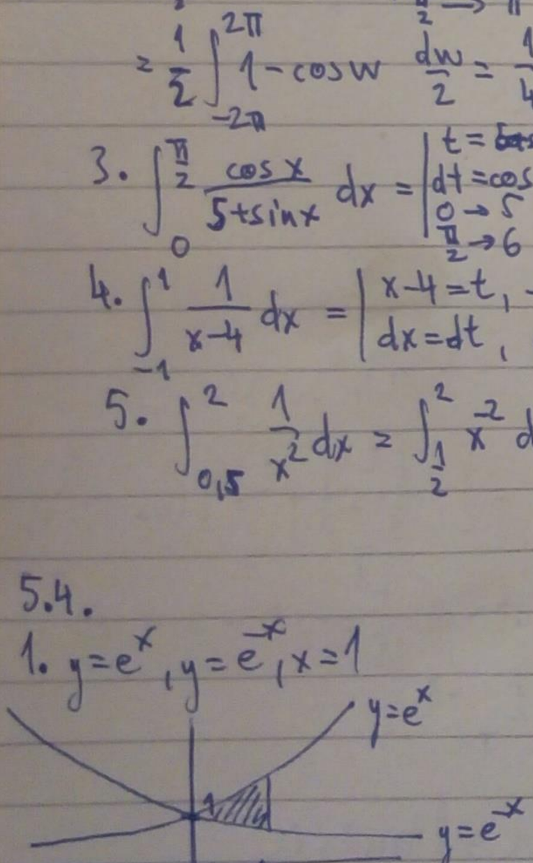
3. $\int_0^{\frac{\pi}{2}}\frac{\cos x}{5+\sin x}dx = \left|\begin{matrix} t=5+\sin x \\ dt=\cos x\,dx \\ 0\to5 \\ \frac{\pi}{2}\to6 \end{matrix}\right| = \int_5^6\frac{1}{t}dt = \left[\ln|t|\right]_5^6 = \ln 6 - \ln 5 = \ln\frac{6}{5}$

4. $\int_{-1}^{1}\frac{1}{x-4}dx = \left|\begin{matrix} x-4=t, & -1\to-5 \\ dx=dt, & 1\to-3 \end{matrix}\right| = \int_{-5}^{-3}\frac{1}{t}dt = \left[\ln|t|\right]_{-5}^{-3} = \ln|-3| - \ln|-5| = \ln 3 - \ln 5 = \ln\frac{3}{5}$

5. $\int_{0,5}^{2}\frac{1}{x^2}dx = \int_{\frac{1}{2}}^{2}x^{-2}dx = \left[\frac{x^{-1}}{-1}\right]_{\frac{1}{2}}^{2} = \frac{2^{-1}}{-1} - \frac{(\frac{1}{2})^{-1}}{-1} = -\frac{1}{2}+2 = \frac{3}{2}$

5.4.

1. $y=e^x, y=e^{-x}, x=1$



$\int_0^1 e^x-e^{-x}dx = \left[e^x+e^{-x}\right]_0^1 = e^1+e^{-1}-(e^0+e^0)$

$= e+\frac{1}{e}-(1+1)$

$= e+\frac{1}{e}-2$

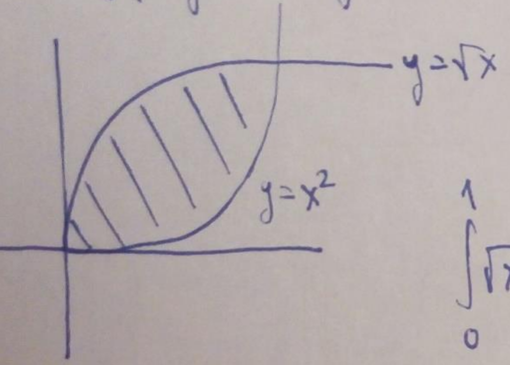
$y=e^x=e^{-x} \to \ln e^x = \ln e^{-x}$

$x=-x$

$2x=0$

$x=0$

$x^2 = y,\ y^2 = x \rightarrow y = \sqrt{x}$



$y = x^2 = (y^2)^2 = y^4$

$y = y^4$

$0 = y^4 - y = y(y^3-1) \rightarrow y = 0;1 \Rightarrow x = 0;1$

$$\int_0^1 \sqrt{x} - x^2\,dx = \int_0^1 x^{\frac{1}{2}} - x^2\,dx = \left[\frac{x^{\frac{3}{2}}}{\frac{3}{2}} - \frac{x^3}{3}\right]_0^1 = \left[\frac{2}{3}x^{\frac{3}{2}} - \frac{x^3}{3}\right]_0^1$$

$$= \frac{2}{3}1^{\frac{3}{2}} - \frac{1^3}{3} - \left(\frac{2}{3}0^{\frac{3}{2}} - \frac{0^3}{3}\right) = \frac{2}{3} - \frac{1}{3} - 0 + 0 = \frac{1}{3}$$