Here are some potentially helpful reminders:

$$\int \sec x\,dx = \log(\sec x + \tan x)$$
$$\int \csc x\,dx = -\log(\csc x + \cot x)$$

Problem 1. What follows are a mixture of functions in desperate need of integration in terms of elementary functions.

1. $\displaystyle\int \frac{dx}{\sqrt{x^2-1}}$
2. $\displaystyle\int \frac{dx}{x\sqrt{1-x^2}}$
3. $\displaystyle\int \sqrt{1-x^2}\,dx$
4. $\displaystyle\int \sqrt{1+x^2}\,dx$
5. $\displaystyle\int \frac{dx}{1+\sqrt{x+1}}$
6. $\displaystyle\int \frac{dx}{1+\mathbf{e}^x}$
7. $\displaystyle\int \frac{dx}{\sqrt{x}+\sqrt[3]{x}}$
8. $\displaystyle\int \frac{dx}{\sqrt{x}+\sqrt[3]{x}}$
9. $\displaystyle\int \mathbf{e}^{\sqrt{x}}$
10. $\displaystyle\int \frac{dx}{x^4+1}$
11. $\displaystyle\int \frac{2x^2+x+1}{(x+3)(x+1)^3}$

Problem 2. How about another wall of integrals?

1. $\displaystyle\int \frac{\arctan x}{1+x^2}\,dx$
2. $\displaystyle\int \log\sqrt{1+x^2}\,dx$
3. $\displaystyle\int x\log\sqrt{1+x^2}\,dx$
4. $\displaystyle\int \arcsin\sqrt{x}\,dx$
5. $\displaystyle\int x\arctan x\,dx$
6. $\displaystyle\int \sec^3 x\tan x\,dx$
7. $\displaystyle\int (\arcsin x)^2\,dx$

Problem 3 (Spivak 19-24)**.** Prove that

$$\int_a^b f(x)\,dx = \int_a^b f\big(a+(b-x)\big)\,dx \tag{1}$$

What is the geometric interpretation of this statement?