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Compute

1. $\int_0^1 \frac{1}{1+x} dx$

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

3. $\int_0^1 \frac{x}{1+x^2} dx$

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

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

6. $\int_0^1 \frac{1}{\sqrt{1+x^2}} dx$

7. $\int_0^1 \frac{x}{\sqrt{1+x^2}} dx$

The answers (out of order) are

$$\sqrt{2} - 1 \quad \frac{\ln(2)}{2} \quad \operatorname{arcsinh}(1) \quad \ln(2) \quad \frac{\pi}{4} \quad 1 \quad \frac{\pi}{2}$$

Compute

8. $\sinh(\ln(2))$

9. $\cosh(\ln(2))$

10. $\arcsin(1)$

11. $\arctan(1)$

12. $\operatorname{arcsinh}\left(\frac{3}{4}\right)$

13. $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$

14. $\lim_{x \rightarrow 0} \frac{\cos(x) - 1}{x^2}$

15. $\lim_{x \rightarrow 0} \frac{\cosh(x) - 1}{x^2}$

The answers (out of order) are

$$-\frac{1}{2} \quad \frac{1}{2} \quad \frac{3}{4} \quad \frac{5}{4} \quad \frac{\pi}{4} \quad \frac{\pi}{2} \quad \ln(2) \quad e$$