1. $\int_2^{+\infty} \frac{dx}{x\ln^2(x)} =$
   $-\frac{1}{\ln(x)}\Big|_{+\infty}^{2} =$
   $\text{lím}_{x\to+\infty} -\frac{1}{\ln(2)} + \frac{1}{\ln(x)} = -\frac{1}{\ln(2)}$

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

   - $x = \sin(u) \Rightarrow \arcsin(x) = u$
   - $dx = \cos(u)du$

   $\Rightarrow \int_0^1 \frac{dx}{\sqrt{1-x^2}} =$
   $\int_0^1 \frac{\cos(u)du}{\sqrt{1-\sin^2(u)}} \overset{\sin^2(u)+\cos^2(u)=1}{=}$
   $\int_0^1 \frac{\cancel{\cos(u)}du}{\cancel{\sqrt{\cos^2}(u)}} =$
   $\int_0^1 1du = u = \arcsin(x)|_0^1 = \arcsin(0) - \arcsin(1) = -\arcsin(1)$

3. $\int_0^{+\infty} \frac{\arctan(x)}{1+x^2}dx$

   - $u = \arctan(x)$
   - $du = \frac{1}{1+x^2}dx$

   $\Rightarrow \int_0^{+\infty} udu =$
   $\frac{\arctan(x)^2}{2}\Big|_0^{+\infty} =$
   $\text{lím}_{x\to\infty} \frac{\arctan(x)^2}{2} = \frac{\pi^2}{8}$

4. $\int_{-\infty}^{+\infty} \frac{dx}{1+x^2}$
   $= \arctan(x)|_{-infty}^{+\infty} = -\pi$

5. $\int_{-\infty}^{+\infty} \frac{dx}{x^2+4x+9} =$
   $\int_{-\infty}^{+\infty} \frac{dx}{(x+2)^2+5} =$
   $\int_{-\infty}^{+\infty} \frac{dx}{(x+2)^2+\sqrt{5}^2}$

   - $u = x - 2$
   - $du = dx$

   $\int_{-\infty}^{+\infty} \frac{du}{u^2+\sqrt{5}^2} =$
   $\frac{1}{\sqrt{5}}\arctan\left(\frac{x}{\sqrt{5}}\right)\Big|_{-\infty}^{+\infty} = \frac{\pi}{\sqrt{5}}$

6. $\int_0^{+\infty} \frac{x}{\sqrt{1+x^5}}dx$

7. $\int_{-1}^{3} \frac{dx}{(1-x)^3}$

   - $u = 1 - x$
   - $du = -dx$

   $\int_{-1}^{3} \frac{-dx}{u^3}$
   $\int_{-1}^{3} \frac{-dx}{u^3}$
   $\frac{1}{2}(1-x)^{-2}\ |_{-1}^{3}$
   $\frac{1}{2(1-3)^2} - \frac{1}{2(2)^2} = Converge$

8. $\int_{-\infty}^{+\infty} \sin(2x)dx =$

   $\frac{-\cos(2x)}{2}\Big|_{-\infty}^{+\infty} =$

   $diverge$

9. $\int_0^4 \frac{x}{x^2-4}dx =$

   $\int_0^4 \frac{x}{(x-2)(x+2)}dx =$

   - $u = x^2 - 4$
   - $du = 2xdx \Rightarrow dx = \frac{du}{2x}$

   $\int_0^4 \frac{\cancel{x}}{u}\frac{du}{2\cancel{x}} =$

   $\frac{\ln\left(x^2-4\right)}{2}\Big|_0^4 =$

   $\frac{\ln(0)}{2} - \frac{\ln(-4)}{2} = Diverge$