## Solving Equations with $e$ and $\ln x$

We know that the natural log function $\ln(x)$ is defined so that if $\ln(a) = b$ then $e^b = a$. The *common log* function $\log(x)$ has the property that if $\log(c) = d$ then $10^d = c$. It's possible to define a logarithmic function $\log_b(x)$ for any positive base $b$ so that $\log_b(e) = f$ implies $b^f = e$. In practice, we rarely see bases other than 2, 10 and $e$.

Solve for $y$:

1. $\ln(y+1) + \ln(y-1) = 2x + \ln x$
2. $\log(y+1) = x^2 + \log(y-1)$
3. $2 \ln y = \ln(y+1) + x$

Solve for $x$ (hint: put $u = e^x$, solve first for $u$):

4. $\dfrac{e^x + e^{-x}}{e^x - e^{-x}} = y$
5. $y = e^x + e^{-x}$