Now, assuming $r \neq s$, integrate to get

$$\frac{1}{1-s/r}\left[(p^f)^{1-s/r} - (p^i)^{1-s/r} \right] = -\lambda r \left(\frac{H}{\lambda}\right)^{\frac{r-1}{r}} (t^f - t^i) \Rightarrow$$

$$\left[(p^f)^{\frac{r-s}{r}} - (p^i)^{\frac{r-s}{r}} \right] = \lambda (-r)\left(1-\frac{s}{r}\right)\left(\frac{H}{\lambda}\right)^{\frac{r-1}{r}} (t^f - t^i) \Rightarrow$$

$$\left[(p^f)^{\frac{r-s}{r}} - (p^i)^{\frac{r-s}{r}} \right] = \lambda (s-r)(t^f - t^i)\left[(q^i)^r (p^i)^s \right]^{\frac{r-1}{r}} \Rightarrow$$

$$(p^f)^{\frac{r-s}{r}} = (p^i)^{\frac{r-s}{r}} \left[1 + \lambda (s-r)(t^f - t^i)(q^i)^{r-1} (p^i)^{\frac{s-r}{r} + \frac{rs-s}{r}} \right]$$

$$\Rightarrow (p^f)^{\frac{r-s}{r}} = (p^i)^{\frac{r-s}{r}} \left[1 + \lambda (s-r)(t^f - t^i)(q^i)^{r-1} (p^i)^{s-1} \right] \Rightarrow$$

$$\boxed{p^f = p^i \left[1 + \lambda (s-r)(t^f - t^i)(q^i)^{r-1} (p^i)^{s-1} \right]^{\frac{r}{r-s}}} \quad (1.4.23)$$

Note: Let us compute $\lambda (q^f)^r (p^f)^s$ using (1.4.22) + (1.4.23).

We get $\lambda (q^f)^r (p^f)^s = \lambda (q^i)^r (p^i)^s \otimes$

$$\left[1 + \lambda (s-r)(t^f - t^i)(q^i)^{r-1} (p^i)^{s-1} \right]^{\left(\frac{s}{s-r}\right)(r) + \left(\frac{r}{r-s}\right)s}$$

But, $\frac{rs}{s-r} + \frac{rs}{r-s} = 0 \Rightarrow \boxed{\lambda (q^f)^r (p^f)^s = \lambda (q^i)^r (p^i)^s}$,

Which is what we expect since H is conserved!