Interpolation Examples

Consider the case of superheated water vapor at 100 bar and 409°C

Table

$P = 100$ bar

T (°C)	v (m^3/kg)	u ($\frac{kJ}{kg}$)	h ($\frac{kJ}{kg}$)	s ($\frac{kJ}{kg \cdot K}$)
400	.02641	2832.4	3096.5	6.2120
(409)			(h)	
440	.02941	2922.1	3213.2	6.3805

If we need only one property (e.g., h), we could match slopes:

$$\frac{(3213.2 - 3096.5)\ kJ/kg}{(440 - 400)°C} = \frac{(h - 3096.5)\ kJ/kg}{(409 - 400)°C} \quad (1) \Rightarrow \boxed{h = 3122.75 \frac{kJ}{kg}}$$

Another way to think about this (which can be useful when getting multiple properties at the desired temperature), is to note that 409°C is a certain percent of the way from 400°C to 440°C. Specifically

$$\frac{409°C - 400°C}{440°C - 400°C} = 0.225 = 22.5\%$$

That being the case, we can note that h is 22.5% of the way from $3096.5 \frac{kJ}{kg}$ to $3213.2 \frac{kJ}{kg}$. So if we multiply

$(0.225) \cdot (3213.2 - 3096.5) \frac{kJ}{kg}$, we get $26.26 \frac{kJ}{kg}$.

If we add this to the lower value: $3096.5 \frac{kJ}{kg} + 26.26 \frac{kJ}{kg}$, we get the same result: $\boxed{3122.76\ kJ/kg}$

And, once we have this value (0.225), we can use it to get the other properties, e.g., s. $s = (0.225) \cdot (6.3805 - 6.2120) \frac{kJ}{kg} + 6.2210 \frac{kJ}{kg}$

$$\boxed{s = 6.2589\ kJ/kg}$$

Note that this isn't a "different method." The second way for getting h is just what you get if you cross-multiply Eq (1), above.