

5. (a) Fahrenheit and Celsius temperatures are related by  $T_F = (9/5)T_C + 32^\circ$ .  $T_F$  is numerically equal to  $T_C$  if  $T_F = (9/5)T_F + 32^\circ$ . The solution to this equation is  $T_F = -(5/4)(32^\circ) = -40^\circ\text{F}$ .
- (b) Fahrenheit and Kelvin temperatures are related by  $T_F = (9/5)T_C + 32^\circ = (9/5)(T - 273.15) + 32^\circ$ . The Fahrenheit temperature  $T_F$  is numerically equal to the Kelvin temperature  $T$  if  $T_F = (9/5)(T_F - 273.15) + 32^\circ$ . The solution to this equation is

$$T_F = \frac{5}{4} \left( \frac{9}{5} \times 273.15 - 32^\circ \right) = 575^\circ\text{F} .$$

- (c) Since  $T_C = T - 273.15$  the Kelvin and Celsius temperatures can never have the same numerical value.