

# Physics 301

Homework due 9 October 2024

1) One kilogram of water at  $0^\circ\text{C}$  is brought into contact with a heat reservoir at  $100^\circ\text{C}$ .

When the water has reached  $100^\circ\text{C}$ ,

- (a) what has been the change in entropy of the water?
- (b) what has been the change in entropy of the reservoir?
- (c) what has been the change in entropy of the entire system?

2) Stowe problem 9-18.

3) Stowe problem 9-23.

4) Find the work necessary to inflate a spherical soap bubble to a radius  $R$  in the atmosphere. The surface tension of the soap is  $\mathfrak{S}$ .

5) Consider a system whose equation of state is given by  $\frac{p^2}{T^{1/3}} e^{aV} = b$ , where  $p$  is pressure,

$T$  is absolute temperature,  $V$  is volume, and  $a$  and  $b$  are constants. Calculate the

- (a) isothermal compressibility
- (b) coefficient of volume expansion