140a HW 3 **revised**, Due 1/29/19

$\star$ All numbered exercises are from Blundell and Blundell.

1. Suppose that $df = xe^{-y}dx + g(x,y)dy$ is an exact differential.

   (a) What is $g(x,y)$?

   (b) What is $\int_\Gamma df$ where Γ is a semicircle of radius 5 that starts at $(x,y) = (0,0)$ and ends at $(x,y) = (10,0)$. Hint: do not actually integrate over Γ but, instead, argue that you can get the same answer by integrating over an easier path, and do that integral.

2. 12.3.

3. (a) Calculate the work, in J, that is produced when $100g$ of liquid water vaporizes into steam at 100^oC against a pressure of one atmosphere (which is the same as the vapor pressure of steam at 100^oC). The densities of water and steam at this pressure and temperature are $0.958g/cm^3$ and $0.598kg/m^3$, respectively.

   (b) What energy change is involved in the process? The latent heat of vaporation (i.e. the added energy cost to convert from liquid to gas) is $2257J/g$.

4. An ideal diatomic gas initially has $p_i = 4 \times 10^5 Pa$ and $V_i = 2m^3$ and $T_i = 293K$. It undergoes a reversible process with final pressure $p_f = 4p_i$.

   (a) Suppose that the process is reversible and isothermal. What is V_f? Compute ΔU, ΔW, and ΔQ for the process, in J.

   (b) Suppose instead the process is reversible and adiabatic. What is V_f. Compute ΔU, ΔQ, and ΔW.

5. 13.4.

6. 13.5.