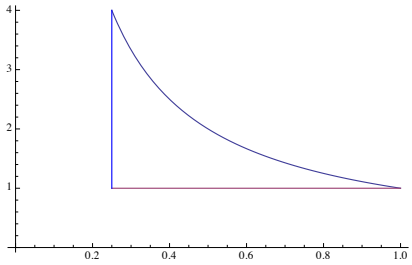
Physics 213 Quiz 2-2 [20 points] Name _____

1. [5 points] How much heat is required to heat six moles of O_2 gas from 300 K to 375 K at a constant volume of 0.2 m^3 ?

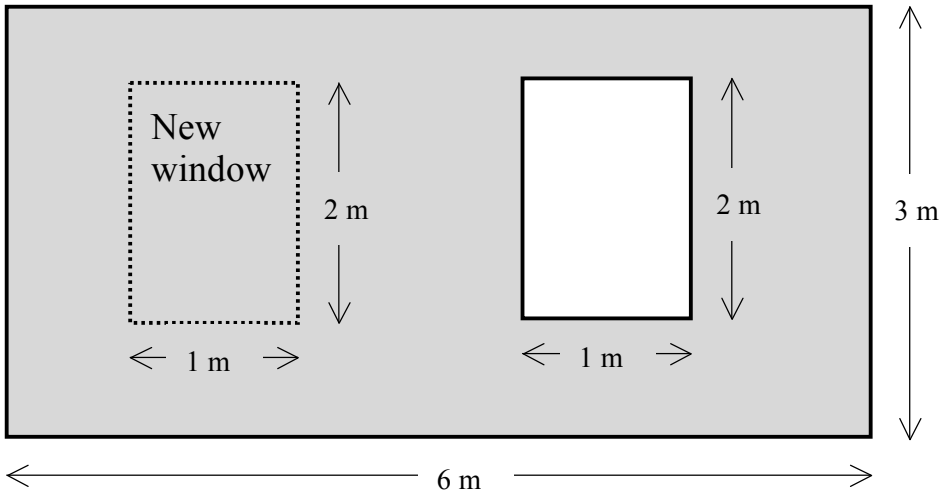
$C_V = 5/2\ nR \rightarrow Q = 5/2\ n\ R\ (75\ K) = 9353\ J$

2. [5 points] Draw (roughly) the P-V diagram for the following 3 process of an ideal gas which form a closed cycle: isothermal compression, constant volume cooling, constant pressure heating.



With axes labeled and a counter clockwise arrow!

2. [10 points] A homeowner wants to add a new window to one of the walls in their house. The wall already has a window and the second window is planned to be identical in size:



The wall is 3 m high and 6 m wide, while the window is 2 m high and 1 m wide, as shown. The walls are 15cm thick and the glass is 1cm thick. On a cold day in Chicago, the outside temperature is -14° C, and the homeowner wants to keep the temperature inside his house at +20° C. Suppose the thermal conductivity of the solid part of the wall is 0.30 W/m·K and the thermal conductivity of the window is 4.50 W/m·K, what is the ratio, H_{new}/H_{old}, of the new heat loss to the old heat loss through this wall? Explain your reasoning.

$H = dT((k_{wall}\ A_{wall}/d_{wall}) + k_{window}\ A_{window}/d_{window}) \rightarrow H_{new}/H_{old} = 1.961$