MAT1505-03/04 17f Quiz 1 Print Name (Last, First) _____ , _____|____
Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC).

1. The fractional volume v of liquid contained in the bottom of a hemispherical tank up to a fractional height $\hbar$ (of the full radius height for a full tank) is given by the formula $\frac{dv}{d\hbar} = \frac{3}{2} \cdot (2\hbar - \hbar^2)$. What is the change in the fractional volume when the fractional height increases from $\hbar = 0.20$ to $\hbar = 0.30$?
[**Optional challenge** for after the quiz and after covering volumes of revolution: derive this rate of change formula.]

2. $\int_0^{20} 60000 \, \frac{e^{-0.6t}}{(1 + 5\, e^{-0.6t})^2} \, dt$.

a) Use the change of variable method to rewrite this integral as a new definite integral in the variable $u = 1 + 5\, e^{-0.6t}$. (with new limits of integration!).
b) Evaluate the integral by hand.
c) Compare the result you find with the technology evaluation of the original integral.

▶ solution