MAT1505-05 04S Test 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 arrows and equal signs when appropriate. Always simplify expressions. BOX final short answers. LABEL parts of problem. Keep answers exact (no decimal approximations, if possible). [See long instructions on reverse].

① Evaluate the integral, if it exists, showing all integration steps. [Exactly!]

a) $\int (\sqrt[4]{u}+1)^2\,du$ b) $\int_3^4 \frac{x}{x^2-4}\,dx$

② $A = \int_0^1 \sin(\pi x)\,dx$

a) Make a diagram indicating (by shading) the region whose area is A and draw the rectangles associated with the $n=2$ midpoint rectangular approximation M_2 to this area.

b) Evaluate M_2 to 3 decimal place accuracy.

c) Now evaluate A exactly, showing each step in the process. (Make sure at no point your limits of integration are misleading.)

d) Evaluate your exact result to 3 decimal place accuracy and evaluate the percentage error: $\text{Error} = \left(\frac{M_2-A}{A}\right)100$.

③ Find the (exact) volume of the solid obtained by rotating the region bounded by the curves $y=2x$ and $y=x^2$ about the y-axis. First make a completely labeled diagram indicating a typical cross-section of this region in the plane corresponding to the integral expression you write down.

④ a) Draw a diagram indicating the region between $y=e^{-x}$ and $y=\frac{1}{2}$ over the interval $0 \le x \le 1$. Show and label the exact intersection point and shade in this region.

b) Express $\int_0^1 |e^{-x}-\frac{1}{2}|\,dx$ as a sum of two integrals with no absolute value signs.

c) Use technology to evaluate them exactly. Report your exact result and choice of technology used.