MAT2500-05 24S Quiz 8   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 when
appropriate). Indicate where technology is used and what type (Maple, GC). Only use technology to CHECK
hand calculations, not substitute for them.

1. Find the volume under the surface $z = y^2\, e^{x\,y}$ above the region bounded by $y = x$, $y = 4$ and $x = 0$. First set up
the two iterated integrals representing this volume and in each case let Maple evaluate the double integral.
Follow these steps:
a) Integrate first in the horizontal direction.
b) Integrate first in the vertical direction.
In each case accompany your work with a new iteration diagram to justify your interation, a diagram shaded by
equally spaced linear cross-sections in the direction of the inner integration variable and a typical one with
bullet point endpoints labeled by the equation of the starting and stopping values of the integration variable for
the inner integral and with an arrowhead midway indicating the variable's increasing direction. Consult the
previous 22F quiz 8 answer key for a model of how to do this.
c) Use Maple to evaluate each such integral exactly. Do they agree as they should? [If you do this by hand, one
of these avoids integration by parts.]

2. a) "Deconstruct" the integral $\displaystyle\int_0^1 \int_{\sqrt{x}}^1 \sqrt{y^3 + 1}\ dy\ dx$ by creating a diagram as above that explains the limits

of integration in the current order in which the successive integrations are done.
b) Create a new diagram explaining the limits for the reversed order of integration.
c) Using that diagram, write down the new iteration of this integral in that reversed order and evaluate it step by
step by hand.
d) Check with Maple that the two iterations have the same numerical value. [Maple gets the first exact
integration wrong, but correct numerical value of 0.4063171388 (I had to convert it to inert form to do this!),
the second order only requires a u-substitution to finish the integration].

▶ **solution**