TA:—————————————————— NAME:——————————————————

*Instructions*: Show all of your work and clearly explain your answers. This is particularly important on problems with a numerical answer, to allow the possibility of partial credit. No books or written notes are allowed during the exam, but you may use your calculator. Also note that this exam should have 3 pages; please check that it does.

| Problem | 1 | 2 | 3 | 4 | 5 | Totals |
|---------|----|----|----|----|----|--------|
| Points | 15 | 25 | 25 | 15 | 20 | 100 |
| Score | | | | | | |

[1] (15 points) (This problem is like Example 6.8 on p. 379.) Use the substitution $u = 4 - 2x$ to convert the given integral into an integral in terms of $u$ only. You do not need to evaluate the integral:

$$\int_0^1 2x\sqrt{4 - 2x}\, dx$$

[2] (25 points) (This problem is like homework problem #29, 5.1.) Let $R$ be the region bounded by the curves $y = \sqrt{x}$, $y = 2 - x$, and $y = 0$. Sketch the region $R$, and express its area in terms of one or more integrals. You do not need to evaluate the integrals.

[3] (25 points) Let $R$ be the region bounded by the curves $y = 1$, $x = 1$, and $y = 100/x^2$. Sketch the region $R$, and write down an integral for the volume of the solid formed by revolving $R$ about the $y$-axis. You do not need to evaluate the integral.

[4] (15 points) (This is homework problem #6, 5.6.) A force of 10 pounds stretches a spring 2 inches. Set up an integral for the work done in stretching the spring 3 inches beyond its natural length. You do not need to evaluate the integral, but indicate what units of work the integral will evaluate to.

[5] (20 points) (This problem is like homework problem #31, 6.4.)  Baby bear's porridge is 150°F when Mother bear sets it out at 9:00 am. The den is a comfy (for bears) 50°F. At 9:10 am, the porridge is 120°F, still too hot for Baby bear, who likes porridge to be 99°F. What time will it be when Baby bear's porridge is just right? (Assume the porridge cools according to Newton's Law of cooling.)