- Write your name on every exam booklet that you use.
- *Show all your work in your exam booklets.*
- Circle your final answers and be sure that you have thoroughly explained them. Your answers do not need to be simplified.
- No calculators or books are permitted. Students are permitted to bring a single $8\frac{1}{2} \times 11$ sheet of paper containing notes, formulas, etc.
- Please turn off cell phones.
- Good luck!

PROBLEMS ON REVERSE SIDE – DO NOT TURN OVER UNTIL INSTRUCTED

[6 points] **1.** (a) What is the norm of the partition $P = \{0, \pi/8, \pi/4, 3\pi/8, \pi/2\}$?

[10 points] (b) Use the partition P and some of the values from the following table to write down a Riemann sum approximation for $\int_0^{\pi/2} \sin x \, dx$ (you don't need to simplify it – you can leave it as a sum of fractions).

x	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin x$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1

2. Evaluate the following integrals.

[6 points] (a) $\int_{-2}^{2} (x^3 - 2x + 3) \, dx$

[6 points] (b) $\int_{1}^{2} \sqrt{3x+1} \, dx$

[6 points] (c) $\int x^3 \cos(x^4 + 2) \, dx$

3. How many subintervals are required to estimate $\int_0^3 \sin x \, dx$ to within an absolute error of 0.02 using

[8 points] (a) the trapezoid rule

[8 points] (b) Simpson's rule.

4. Find the volume of the solid generated by rotating the region bounded by the curves $y = \sqrt{x}, y = x$

[10 points] (a) about the x-axis

[10 points] (b) about the line $x = -1$.

[14 points] **5.** Find the length of the curve $y = \int_0^x \sqrt{\cos 2t} \, dt$ from $x = 0$ to $x = \pi/4$.

[16 points] **6.** Use the method of slicing to find the volume of the region in the first octant (i.e. $x \geq 0$, $y \geq 0$, $z \geq 0$) which is bounded by the coordinate planes $x = 0$, $y = 0$, $z = 0$ and by the plane $x + y + z = 1$. (HINT: the region has 4 triangular faces and vertices at the points $(0,0,0)$, $(1,0,0)$, $(0,1,0)$, $(0,0,1)$.)