

**You may keep this page of questions.** Turn in your answers with all of your work on the green paper. Each problem is worth 20 points.

**You are NOT allowed to use Mathcad or a calculator for this exam.**

(1) Sketch a graph of the region in the  $xy$ -plane that is bounded by  $x = -1$ ,  $y = 2$  and  $x + 1 = y^2$ . Then find the area of this region.

(2) Sketch a graph of the curve having polar equation  $r = 4 \sin \theta$  and identify this curve by name.

(3) Find the volume of the solid of revolution that is generated by revolving the region bounded by  $x = 0$ ,  $x + y = 2$  and  $y = x^3$  about the  $y$ -axis.

(4) Find the arc length of the curve  $y = 2\sqrt{x^3}$  between  $(0, 0)$  and  $(1, 2)$ . You are expected to find an exact value rather than a decimal approximation for an answer on this problem.

(5) The base of a solid is the region in the  $xy$ -plane that is bounded by  $y = 0$  and  $y = \sqrt{4x - x^2}$ . Every cross-section of the solid that is perpendicular to the  $x$ -axis is a square with a side in the base. Find the volume of this solid.