

Name:

score:

Write only your name on the cover sheet. Write on one side only of each blank sheet. No calculator, as exact values are required where asked for.

1.

(a) Find a cartesian equation for the curve  $r = 2 \sin \theta$ .(b) Find a polar equation for the curve  $x + y = 1$ .

2. Find the volume of the solid obtained by rotating the region bounded by

$$y = \ln x, y = 1, y = e, x = 0$$

about the  $y$ -axis. Sketch the region, the solid, and a typical disc, annulus (washer) or cylindrical shell.

3.

(a) Set up an integral for the length of the arc of curve

$$x = t + \sqrt{t}, y = t - \sqrt{t}, 0 \leq t \leq 1$$

but do not compute it.

(b) Sketch (shade) the region in the cartesian plane given by  $r \geq 1, \pi \leq \theta \leq 2\pi$ .4. Find the volume of the solid with base the triangle of vertices  $(0, 0), (1, 0), (0, 1)$  and cross-sections perpendicular to the  $y$ -axis, equilateral triangles.

5. Evaluate the following:

(a)  $\int_{-1}^2 |e^x - 1| dx$ .

(b)  $\int \frac{dx}{x + x\sqrt{x}}$ .

6. Consider the surface obtained by rotating the curve  $y = 1/x, 1 \leq x < \infty$  about the  $x$ -axis (*Gabriel's horn*). Sketch it. Show that its (surface) area is infinite.