

Answer all of the following questions.

Calculators and mobile phones are not allowed.

1. Evaluate the following integrals:

$$(a) \int \cot^2 x \sin^3 x \, dx$$

$$(b) \int \arcsin \sqrt{x} \, dx$$

$$(c) \int \frac{x}{\sqrt{x^2 + 2x}} \, dx$$

$$(d) \int \frac{3x^2 + 11x + 7}{(2x - 1)(x^2 + 6x + 10)} \, dx$$

$$(e) \int \frac{dx}{\sqrt{1 - \sqrt{x - 2}}}$$

5 points each

2. Determine whether the improper integral

$$\int_0^1 \ln(x + x^2) \, dx$$

is convergent or divergent and if convergent find its value.

5 points

3. (a) Sketch the polar curves

$$(1) \quad r = 3 - 3 \sin \theta$$

$$(2) \quad r = -2 \sin \theta$$

and label at least 4 points on each curve.

(b) Find the area that is inside the curve (1) and outside the curve (2).

5 points each

Total 40 points