Calculators and mobile phones are not allowed.

Answer all of the following questions.

1. [6 points each] Evaluate the following integrals:

(a)
$$\int e^x(\sin x - \cos x)\,dx$$

(b)
$$\int \frac{x^3 - 1}{x^2 + x - 6}\,dx$$

(c)
$$\int \frac{e^x}{e^{2x} - 4e^x + 8}\,dx$$

(d)
$$\int \frac{dx}{1 - \sin x}$$

(e)
$$\int \frac{1}{\sqrt{x^2 - 16}}\,dx$$

2. [6 points] Determine whether the following integral converges, if it converges, find its value.

$$\int_2^3 \frac{dx}{\sqrt{-x^2 + 4x - 3}}$$

3. [3+4 points] Let C be the curve given by the parametric equations

$$x = \cos^3 t, \quad y = \sin^3 t; \qquad 0 \le t \le \pi/3.$$

   (a) Find the slope of the tangent line at the point on the curve C that corresponds to $t = \pi/4$.
   (b) Find the length of the curve C.

4. [4+3 points] Let C be the curve given by the polar equation $r = \sin 3\theta$.
   (a) Sketch the graph of the curve C.
   (b) Find the area of the region enclosed by the curve C.