Calculators and mobile phones are not allowed.

Answer all of the following questions.

1. Find the following integrals:

(a) $\quad \displaystyle\int \sqrt{x}\cos\sqrt{x}\,dx$ (5 *points*)

(b) $\quad \displaystyle\int \frac{3x+5}{x^3-4x^2+x-4}\,dx$ (5 *points*)

(c) $\quad \displaystyle\int \frac{\sec^4 x}{(\cot x)^{\frac{5}{2}}}\,dx$ (5 *points*)

(d) $\quad \displaystyle\int \frac{(x-3)^3}{\sqrt{-x^2+6x-5}}\,dx$ (5 *points*)

(e) $\quad \displaystyle\int \sqrt{1-2\sqrt{x}}\,dx$ (4 *points*)

2. Determine whether the following integrals are convergent or divergent? Find their values, if convergent.

(a) $\quad \displaystyle\int_2^\infty \frac{dx}{x^2-2x+4}$ (4 *points*)

(b) $\quad \displaystyle\int_{-1}^1 \frac{1+x}{1+\sqrt[3]{x}}\,dx$ (4 *points*)

3. Identify the following conic section:

$$9x^2-4y^2-18x-16y+29=0.$$

Sketch the graph and find the centre, focus (or foci), vertex (or vertices) and asymptotes (if they exist) of this conic section.   (8 *points*)

Total 40 points