1. Please briefly describe what is "calculus". (15%)

2. Who invented "calculus" in the 17^{th} century? (10%)

3. PROOF. (15%)
   If f is the function defined by:
   $$f(x) = 2x + 1 \quad \text{for} \quad x \leqq 0$$
   $$f(x) = x^2 - x \quad \text{for} \quad x > 0$$
   then $\lim f(x)$ does not exist for $x \to 0$.

4. Differentiate $f(x) = (\sec 4x + \tan 2x)^5$. (10%)

5. Find the area between the curves: (15%)
   $$y = 4x \quad \text{and} \quad y = x^3$$
   from $x = -2$ to $x = 2$.

6. Evaluate $\int (x^2 - 1)(x^3 - 3x + 2)^3 dx$ from $x = 0$ to $x = 2$. (10%)

7. Calculate $\int x \sin 2x \, dx$. (10%)

8. PROOF. (15%)
   The length of the circumference of a circle with radius r is $2\pi r$.