1. f is a function defined on $[0,1]$. Some of its values are shown in the table below:

x	0	0.125	0.25	0.375	0.5	0.625	0.75	0.875	1
$f(x)$	2	2.5	3.5	3	4	4.5	3.5	2	1.5

   Approximate $\int_0^1 f(x)\,dx$ by the following rules:

   (i). Midpoint Rule for $n=4$

   (ii). Trapezoid Rule for $n=4$

   (iii). Simpson's Rule for $n=8$

2. How large should n be to guarantee that the Midpoint Rule Approximation to $\int_0^1 e^{x^2}\,dx$ is accurate to within $0.00001 = 10^{-5}$?

3. Determine if each of the following improper integrals is convergent or divergent, and evaluate if it is convergent:

   (i). $\int_3^{+\infty} \frac{1}{(x-2)^{\frac{3}{2}}}\,dx$

   (ii). $\int_0^{+\infty} \frac{x^2}{\sqrt{1+x^3}}\,dx$

   (iii). $\int_{-\infty}^{+\infty} xe^{-x^2}\,dx$

   (iv). $\int_0^1 \frac{\ln x}{\sqrt{x}}\,dx$

   (v). $\int_0^1 \frac{1}{\sqrt{1-x^2}}\,dx$

   (vi). $\int_0^9 \frac{1}{\sqrt[3]{x-1}}\,dx$

   (vii). $\int_{-1}^1 \frac{e^x}{e^x-1}\,dx$

   (viii). $\int_0^{+\infty} \frac{1}{\sqrt{x}(1+x)}\,dx$

4. Show that

$$\int_0^{+\infty} x^2 e^{-x^2}\,dx = \frac{1}{2}\int_0^{+\infty} e^{-x^2}\,dx$$