Name:_____

Student Number:_____

Show all your work and give reasons for your answers. Good luck!

(1) Evaluate the following integrals:

(a) $\int x^{\pi}\, dx$

(b) $\int (x+1)^2 x\, dx$

(c) $\int x \sin(x)\, dx$

(d) $\int \frac{x^3}{2x^4+5}\, dx$

(2) (a) Determine the minimal n needed to approximate $\int_0^{1/10} \sin(x^2)\,dx$, using the midpoint rule, with an error of at most 10^{-10}.

(b) Use $n = 4$ and the midpoint rule to approximate the integral in (2a).

(3) Evaluate, if possible, $\int_0^5 \frac{1}{x-3}\,dx$

(4) Let R be the region bounded by the graph of $y = f(x) = x^7 + x^3 + x + 5$, the x-axis and the lines $x = 0$ and $x = 1$.

(a) Set up an integral for the arc-length of the graph of $f(x)$, $0 \leq x \leq 1$.

(b) Set up an integral for the volume of the solid obtained by rotating R about the line $x = -5$

(c) Set up an integral for the volume of the solid obtained by rotating R about the line $y = -5$

(5) Find the interval and radius of convergence of the series $\sum_{n=1}^{\infty}(-1)^n \frac{x^n}{4^n \ln(n)}$

(6) Find the MacLaurin series for the function $f(x) = e^{-x^2}$ and use it approximate $\int_0^{10} e^{-x^2}\,dx$ with an error less than 10^{-10}. [You do **not** need to add the sum of the resulting series]

(7) Find the intersection of the line

$$\frac{x-1}{5} = \frac{y+1}{3} = \frac{z-2}{4}$$

and the plane $2x - y + 3z = 11$

(8) Find the distance between the planes $2x - y + 3z = 11$ and $2x - y + 3z = 20$.