Name	MUN Number

[7]   1. (a) Use the definition of the definite integral as a limit of a sum to evaluate

$$\int_{-1}^{2} (7 + 4x - 3x^2)\, dx.$$

[3]   (b) Check your answer to part (a) using the Fundamental Theorem of Calculus.

[16]   2. Evaluate each of the following definite integrals.

(a) $\displaystyle\int_{\frac{1}{4}}^{\frac{\sqrt{3}}{4}} \frac{1}{\sqrt{1-4x^2}}\, dx$

(b) $\displaystyle\int_{\frac{1}{4}}^{\frac{\sqrt{3}}{4}} \frac{x}{\sqrt{1-4x^2}}\, dx$

(c) $\displaystyle\int_{-2}^{6} f(x)\, dx$ where $f(x) = \begin{cases} 2x^3, & \text{for } x \le -4 \\ x+5, & \text{for } -4 < x < 1 \\ 3x^{-2}, & \text{for } x \ge 1 \end{cases}$

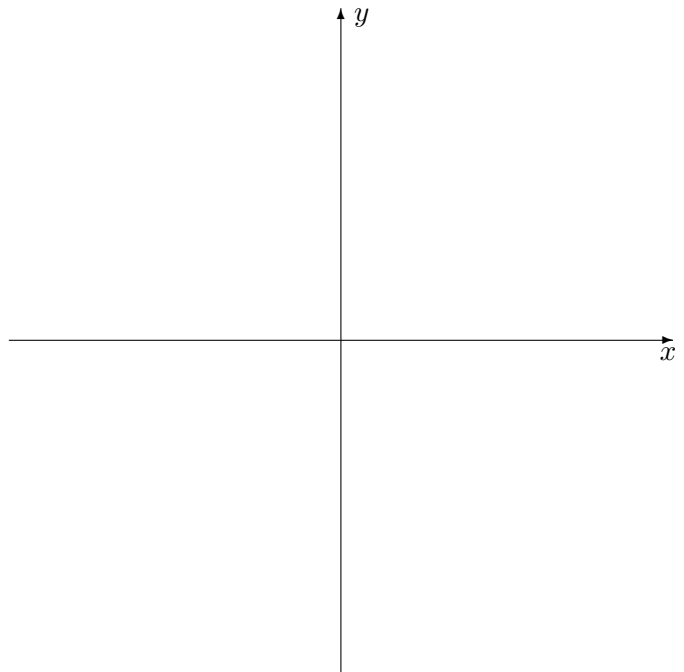[5] 3. Consider the function
$$g(x) = \int_x^{x^4} \tan\left(\sqrt{t}\right) dt.$$

Determine $g'(x)$.

[9] 4. Consider the region R bounded by the curves $y = 12 - x$, $y = \sqrt{x}$ and $y = 2$.

(a) Sketch the graph of the region R on the axes provided.

(b) Set up, but **DO NOT EVALUATE**, an integral (or a sum of integrals) with respect to x which represents the area of R.

(c) Set up, but **DO NOT EVALUATE**, an integral (or a sum of integrals) with respect to y which represents the area of R.

[40]