Math 31 Unit 5 Exam

Sample Name _____

[marks]

1. Evaluate the integral $\int_0^4 (4x - x^2)dx$ from **basic principles**, using the **definition of a definite integral** as given below:

$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x$ where $\Delta x = \frac{b-a}{n}$, $x_i = a + i\Delta x$ and *f(x)* is a continuous function defined on the interval [*a*,*b*]. Show all work!

[5]

2. Evaluate the following definite integrals:

a) $\int_1^3 \frac{x^4 - x^3 + x^2 + 1}{x^3} dx$

b) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} (\csc x \cot x) dx$

[9]

c) $\int_1^3 x^3 \ln x \, dx$

3. Evaluate the following indefinite integrals:

a) $\int \frac{6x^2+5}{(2x^3+5x-8)^3}\,dx$

b) $\int \cos^5 x\,dx$

[9]

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

4. Find the volume of the solid obtained when the region between $y = x^2$ and $y = \sqrt{x}$ for $0 \le x \le 1$ is rotated about the x-axis.

[4]

[27] total marks