

## Practice Final – Math 3B, Fall 2004

The questions in the exam will be similar in nature to the following:

1. Evaluate the limit

$$\lim_{n \rightarrow \infty} \frac{1}{n} \sum_{i=1}^n \left(4 + \frac{i}{n}\right)^4$$

2. Evaluate the limit

$$\lim_{h \rightarrow 0} \frac{1}{h} \int_2^{2+h} x^3 \log(x+1) dx$$

3. Find the derivative of the function

$$g(x) = \int_{2x}^{4x} \frac{t^2 - 1}{2 + \cos(t)} dt$$

4. Find the area of the region enclosed by the curves  $y = \sqrt{x+1}$ ,  $y = \frac{1}{1+x}$ , the  $y$ -axis, and  $x = 1$ .

5. Find the volume of the solid obtained by rotating the region bounded by the curves  $y = \sqrt{x^2 + 1}$ ,  $y = x^2$ ,  $x = 0$ , and  $x = 1$ , around the  $OX$  axis.

6. Evaluate the integral

$$\int \cos(x) \ln(\sin(x)) dx$$

7. Evaluate the integral

$$\int e^x \sin(x) dx$$

8. Use integration by parts to show that

$$\int (\ln x)^n dx = x(\ln x)^n - n \int (\ln x)^{n-1} dx$$

9. Evaluate the integral

$$\int \cos^5 x \sin^2 x dx$$

10. Evaluate the integral

$$\int \tan^3 x \sec^5 x dx$$

11. Find

$$\int_0^{3\sqrt{3}/2} \frac{x^3}{(4x^2 + 9)^{3/2}} dx$$

12. Evaluate the integral

$$\int \frac{x^2}{(4 - x^2)^{3/2}} dx$$

13. Evaluate

$$\int \frac{x^2 + 4}{x(x^2 + 1)} dx$$

14. Evaluate

$$\int \frac{e^{2x}}{e^{2x} + 3e^x + 2} dx$$

15. Determine whether the following integral is convergent or divergent:

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

16. Determine whether the following integral is convergent or divergent:

$$\int \frac{1}{\sqrt{x} \sin x} dx$$

17. Evaluate

$$\int_{-\infty}^\infty \frac{e^{2x}}{e^{4x} + 2e^{2x} + 1} dx$$

18. Compute the length of the curve

$$y = \cosh x, \quad 0 \leq x \leq 1$$

19. Compute the length of the curve

$$y = 1 + 6x^{3/2}, \quad 0 \leq x \leq 1$$

20. Find the area of the surface obtained by rotating the curve

$$y = \cosh x, \quad 0 \leq x \leq 1$$

about the  $x$ -axis.