

MA 241-004 (Fall 2006)
Test 1 Review Problems

Evaluate the following indefinite and indefinite integrals.

- | | | |
|--|---|---------------------------------------|
| 1. $\int 5 \cos(x) - 2 \sec^2(x) dx$ | 2. $\int_{-1}^2 x(x^2 - 4) dx$ | 3. $\int_{-\pi/4}^{\pi/4} \sin 2x dx$ |
| 4. $\int \frac{x - 28}{x^2 - x - 6} dx$ | 5. $\int \frac{x^2}{\sqrt{x^3 + 3}} dx$ | 6. $\int \sec^2(2x) \tan(2x) dx$ |
| 7. $\int \sin^3(x) \cos(x) dx$ | 8. $\int e^{2x} \sin(3x) dx$ | 9. $\int (x - 1)e^x dx$ |
| 10. $\int \frac{2x^3 - 5x^2 + 4x - 4}{x^2 - x} dx$ | 11. $\int \frac{1}{7x - 2} dx$ | 12. $\int \frac{x}{x^2 - 1} dx$ |
| 13. $\int_1^e \frac{\ln x}{x} dx$ | 14. $\int \frac{e^x}{e^x - 1} dx$ | 15. $\int x e^{3x^2 - 1} dx$ |
| 16. $\int \tan x \sec^4 x dx$ | 17. $\int_0^2 x e^{3x} dx$ | 18. $\int_0^{\pi} x \sin x dx$ |

Evaluate the following improper integrals. State whether the integral converges or diverges.

- | | | |
|--|----------------------------------|-----------------------------------|
| 19. $\int_0^{16} \frac{1}{x^{1/4}} dx$ | 20. $\int_1^{\infty} x \ln x dx$ | 21. $\int_0^1 \frac{6}{x - 1} dx$ |
|--|----------------------------------|-----------------------------------|

22. Use the Midpoint Rule, Trapezoidal Rule, and Simpson's Rule with $n = 4$ to approximate the definite integral $\int_0^2 \frac{1}{1 + x^3} dx$.

Find the area bounded by the given curves.

23. $y = e^x - 1$, $y = x^2 - x$, $x = 1$
24. $x + y = 0$, $x = y^2 + 3y$
25. Find the volumes of the solids obtained by rotating the region bounded by the curves $y = x$ and $y = x^2$ about the following lines
- the x -axis
 - the y -axis
 - $y = 2$

26. Find the length of the curve with parametric equations $x = 3t^2$, $y = 2t^3$, $0 \leq t \leq 2$

27. Find the length of the curve $y = \frac{1}{6}(x^2 + 4)^{3/2}$ on the interval $[0,3]$.

28. Find the average value of the function $f(x) = x^2\sqrt{1+x^3}$ on the interval $[0,2]$.

Answers to Test 1 Practice Problems

1. $5 \sin x - 2 \tan x + C$

2. $\frac{-9}{4}$

3. 0

4. $-5 \ln|x-3| + 6 \ln|x+2| + C$

5. $\frac{2}{3}(x^3 + 3)^{\frac{1}{2}} + C$

6. $\frac{1}{4} \tan^2(2x) + C$

7. $\frac{\sin^4 x}{4} + C$

8. $\frac{2}{13} e^{2x} \sin 3x - \frac{3}{13} e^{2x} \cos 3x + C$

9. $(x-1)e^x - e^x + C$

10. $x^2 - 3x + 4 \ln|x| - 3 \ln|x-1| + C$

11. $\frac{1}{7} \ln|7x-2| + C$

12. $\frac{1}{2} \ln|x^2-1| + C$

13. $\frac{1}{2}$

14. $\ln|e^x - 1| + C$

15. $\frac{1}{6} e^{3x^2-1} + C$

16. $\frac{\tan^2 x}{2} + \frac{\tan^3 x}{3} + C$

17. $\frac{5}{9} e^6 + \frac{1}{9}$

18. π

19. $\frac{32}{3}$

20. $\infty \rightarrow \text{diverges}$

21. $-\infty \rightarrow \text{diverges}$

22. Midpoint: 1.09189
Trapezoidal: 1.08650
Simpson: 1.09683

23. $e - \frac{11}{6}$

24. $\frac{32}{3}$

25. a) $\frac{2\pi}{15}$ b) $\frac{\pi}{6}$ c) $\frac{8\pi}{15}$

26. $2(5\sqrt{5} - 1)$

27. $\frac{15}{2}$

28. $\frac{26}{9}$