

Math 131**Supplementary problems #5 --- Integration**

A. Evaluate the following indefinite integrals.

$$1. \int (4x^3 + 4e^x - \frac{3}{x} + e) dx$$

$$2. \int \sqrt{x}(x^2 - \frac{1}{x}) dx$$

$$3. \int (x^3 + 2)(x^4 + 8x + 3)^{1/3} dx$$

$$4. \int x^3 \sqrt{2 + x^4} dx$$

$$5. \int \frac{1}{(1-3t)^4} dt$$

$$6. \int \left(-\frac{1}{x^2} + \frac{1/2}{\sqrt{x}} - \frac{1/4}{x^{3/4}} \right) dx$$

$$7. \int (x + e^{5x}) dx$$

$$8. \int (x^2 - 1)e^{x^3 - 3x + 3} dx$$

$$9. \int \frac{e^x}{(e^x + 1)^2} dx$$

$$10. \int \frac{1}{x \ln \sqrt{x}} dx$$

$$11. \int \frac{x}{\sqrt[4]{x+2}} dx$$

$$12. \int \frac{2t^2 + t^2 \sqrt{t} - 1}{t^2} dt$$

$$13. \int \frac{1}{x^2 + 2x + 1} dx$$

$$14. \int \frac{x+1}{(2x^2 + 4x + 1) \ln(2x^2 + 4x + 1)} dx$$

$$15. \int \left(\cos(3x) - \frac{\sin x}{\sqrt{1 + \cos x}} \right) dx$$

B. Evaluate the following definite integrals by The Fundamental Theorem of Calculus.

$$1. \int_1^4 \left(\frac{3}{\sqrt{x}} - \frac{6}{\sqrt{x}} \right) dx$$

$$2. \int_0^1 (2x-1)^{100} dx$$

$$3. \int_0^3 1000e^{-0.1t} dt$$

$$4. \int_0^1 t^2 e^{-t^3} dt$$

$$5. \int_0^3 \frac{dx}{2x+3}$$

$$6. \int_e^{e^2} \frac{dx}{x\sqrt{\ln x}}$$

Answers:

A.

1. $x^4 + 4e^x - 3\ln|x| + ex + C$

2. $\frac{2}{7}\sqrt{x^7} - 2\sqrt{x} + C$

3. $\frac{3}{16}(x^4 + 8x + 3)^{4/3} + C$

4. $\frac{(2+x^4)^{3/2}}{6} + C$

5. $\frac{1}{9}(1-3t)^{-3} + C$

6. $x^{-1} + \sqrt{x} - \sqrt[4]{x} + C$

7. $\frac{1}{2}x^2 + \frac{1}{5}e^{5x} + C$

8. $\frac{1}{3}e^{x^3-3x+3} + C$

9. $-\frac{1}{e^x+1} + C$

10. $2\ln|\ln\sqrt{x}| + C$

11. $\frac{4}{7}(x+2)^{7/4} - \frac{8}{3}(x+2)^{3/4} + C$

12. $2t + \frac{2}{3}t^{3/2} + \frac{1}{t} + C$

13. $-\frac{1}{x+1} + C$

14. $\frac{1}{4}\ln|\ln(2x^2+4x+1)| + C$

15. $\frac{1}{3}\sin(3x) + 2\sqrt{1+\cos x} + C$

B.

1. - 6

2. $\frac{1}{101}$

3. $10,000(1 - e^{-0.3})$

4. $\frac{1}{3}(1 - e^{-3})$

5. $\frac{1}{2}\ln 3$

6. $2(\sqrt{2} - 1)$

If you find any mistakes, please let me know. Thanks! li-chen2@neo.tamu.edu