

Antiderivatives: Review Sheet

Section I: Take the integral of each of the following examples.

1.) $\int (3x - 4x^2 + 1)dx$

2.) $\int \frac{\cos^2 x - 1}{\sin x} dx$

3.) $\int \frac{3x^2 + 1}{x^3 + x - 3} dx$

4.) $\int 3 \csc^2 x dx$

5.) $\int \frac{\cos y}{\sin^2 y} dy$

6.) $\int \sqrt[3]{x^8} dx$

7.) $\int \frac{1}{x^4} dx$

8.) $\int (e^x + 8x) dx$

9.) $\int x(3x + 4) dx$

10.) $\int (x^2 + 5)(x - 11) dx$

11.) $\int (\sin x - \cos x) dx$

12.) $\int \frac{2x}{x^2 + 3} dx$

Section II: Particular Solutions.

13.) If $f'(x) = 3x + 5$, find the general solution; then, find the particular solution for $f(2) = 10$.

14.) Solve the differential equation $f'(x) = \cos x + 1$, $f(0) = 5$.

15.) Find the general solution of $F'(x) = 5x - 8x^3$ and find the general solution that satisfies the initial condition $F(6) = 5$.

16.) Find the general solution of $F'(x) = 12x^2 - 6x + 1$ and find the general solution that satisfies the initial condition $F(3) = 15$.

17.) Solve the differential equation $f'(x) = 3 + x$, $f(0) = 3$, $f(4) = 8$.

18.) Solve the differential equation $f'(x) = 4x$, $f(6) = 10$, $f(2) = 0$.

19.) Solve the differential equation $f'(x) = 6$, $f(0) = 7$, $f(1) = -3$.

Section III: Find the indefinite integral of the examples below. (U-Substitution)

20.) $\int x^3(x^4 + 3)^2 dx$

21.) $\int x\sqrt{x^2 - 5} dx$

22.) $\int (5x^2 - 10x)^5(x - 1) dx$

23.) $\int \sin^3(5x) \cos(5x) dx$

24.) $\int x^3 \sec^2(x^4) dx$

25.) $\int 2x \cos x^2 dx$

26.) $\int 5x^5(3 - x^6)^4 dx$

27.) $\int (4x^3 - 2x^2)^8(3x^2 - x) dx$

28.) $\int x \cos^2(9x^2) \sin(9x^2) dx$

29.) $\int (x - 1)\sqrt{3x^2 - 6x} dx$

30.) $\int \sin(x^2 + x) \cos(x^2 + x)(2x + 1) dx$

31.) $\int x^2 \cos^2(x^3 - 1) \sin(x^3 - 1) dx$

Section IV: Evaluate the definite integral. All answers should be left as a fraction.

32.) $\int_3^5 (x^3 - 6x) dx$

33.) $\int_0^{\pi/3} \sin x dx$

34.) $\int_1^{15} (2x - 7) dx$

35.) $\int_1^{25} 8\sqrt{x} dx$

36.) $\int_2^5 (3x^2 + 4) dx$

37.) $\int_{\pi/2}^{11\pi/6} \cos x dx$

38.) $\int_0^{40} (x^3 - 3x) dx$

39.) $\int_1^5 (3x^5 + 5x^4) dx$

40.) $\int_0^{2\pi/3} \sec^2 x dx$

41.) $\int_2^5 (6x - x^2) dx$

42.) $\int_1^{64} \sqrt{x} dx$

43.) $\int_0^6 (1 - 2x^3) dx$

Answer Key:

1.) $f(x) = \frac{3}{2}x^2 - \frac{4}{3}x^3 + x + C$

2.) $f(x) = \cos x + C$

3.) $f(x) = \ln(x^3 + x - 3) + C$

4.) $f(x) = -3 \cot x + C$

5.) $f(y) = -\csc y + C$

6.) $f(x) = \frac{3}{11}x^{\frac{11}{3}} + C$

7.) $f(x) = -\frac{1}{3x^3} + C$

8.) $f(x) = e^x + 4x^2 + C$

9.) $f(x) = x^3 + 2x^2 + C$

10.) $f(x) = \frac{1}{4}x^4 - \frac{11}{3}x^3 + \frac{5}{2}x^2 - 55x + C$

11.) $f(x) = -\cos x - \sin x + C$

12.) $f(x) = \ln(x^2 + 3) + C$

13.) G: $f(x) = \frac{3}{2}x^2 + 5x + C$; P: $f(x) = \frac{3}{2}x^2 + 5x - 6$

14.) G: $f(x) = \sin x + x + C$; P: $f(x) = \sin x + x + 5$

15.) G: $f(x) = \frac{5}{2}x^2 - 2x^4 + C$; P: $f(x) = \frac{5}{2}x^2 - 2x^4 + 2507$

16.) G: $f(x) = 4x^3 - 3x^2 + x + C$; P: $f(x) = 4x^3 - 3x^2 + x - 69$

17.) $f'(x) = 3x + \frac{1}{2}x^2 + 3$; $f(x) = \frac{3}{2}x^2 + \frac{1}{6}x^3 + 3x - \frac{116}{3}$

18.) $f'(x) = 2x^2 - 62$; $f(x) = \frac{2}{3}x^3 - 62x + \frac{356}{3}$

19.) $f'(x) = 6x + 7$; $f(x) = 3x^2 + 7x - 13$

20.) $\frac{1}{12}(x^4 + 3)^3 + C$

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

22.) $\frac{1}{60}(5x^2 - 10x)^6 + C$

23.) $\frac{1}{20}\sin^4(5x) + C$

24.) $\frac{1}{4}\tan x^4 + C$

25.) $\sin x^2 + C$

26.) $-\frac{1}{6}(3 - x^6)^5 + C$

27.) $\frac{1}{36}(4x^3 - 2x^2)^9 + C$

28.) $-\frac{1}{54}\cos^3(9x^2) + C$

29.) $\frac{1}{9}(3x^2 - 6x)^{3/2} + C$

30.) $\frac{1}{2}\sin^2(x^2 + x) + C$

31.) $-\frac{1}{9}\cos^3(x^3 - 1) + C$

32.) 88

33.) $\frac{1}{2}$

34.) 126

35.) $1984/3$

36.) 3430

37.) $-3/2$

38.) 637600

39.) 10936

40.) $-\sqrt{3}$

41.) 24

42.) $1022/3$

43.) -642