AB Calculus: Rules of Integration

Day	Date	Topic	Assignment
1	Monday, Nov. 9th	Keeper 7.1 - The Substitution Rule	U substitution (packet pgs. 1-3)
2	Tuesday, Nov. 10th	Keeper 7.2 – Integration Inverse Trigonometry	Arc Trig Integration (packet pgs. 4-5)
3	Wednesday, Nov. 11th	Optional Q & A Review U Sub and Arc Trig Integrals	Catch up on all keeper notes and homework. Complete review of U sub and arc trig for extra practice.
4	Thursday, Nov. 12th	Keeper 7.3 - Trigonometric Integrals	**Skills Check – K7.1** Trigonometric Integrals (packet pgs. 6-7)
5	Friday, Nov. 13th	Keeper 7.4 – Integration by Parts	**Skills Check – K7.1 – K7.3** Integration by Parts (packet pgs. 8-10)
6	Monday, Nov. 16th	Keeper 7.5 – Long Division and Partial Fractions	**Skills Check – Quick Integrals 3** Partial Fraction (packet pg. 11-12)
7	Tuesday, Nov. 17th	Review – Mix it Up!!	**Skills Check – K7.4 – 7.5** Catch up on all Homework and Keeper Notes
8	Wednesday, Nov. 18th	Optional Q & A Review Integration Rules	Complete Unit 7 Homework Packet Complete Unit 7 Additional Review
9	Thursday, Nov. 19th	Unit 7 Test – Integration Rules	

U Substitution

1. $\int x \cdot \cos(x^2) dx$

2. $\int x^2 \cdot \sin(4x^3 + 8)\ dx$

3. $\int \frac{x^4}{x^5 - 17}\ dx$

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

5. $\int \frac{x^5}{\sqrt[3]{2x^3 + 7}}\ dx$

6. $\int (1 + \sin(x))^{\frac{5}{2}} \cos(x)\ dx$

7. $\int xe^{-x^2} dx$

8. $\int 4\cos(6x)\ dx$

9. $\int \frac{\ln(x)}{x}\ dx$

10. $\int x^2 e^{4x^3} dx$

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

12. $\int x(3-x^2)^5 dx$

13. $\int \sin 3x \ dx$

14. $\int t^3\sqrt{t^4+2} \ dt$

15. $\int \sin(7x+5)dx$

16. $\int \sec^2\left(\frac{x}{4}\right) dx$

17. $\int \frac{y+2y^2}{\sqrt{y}} \ dy$

18. $\int x \cdot \sin(2x^2)dx$

19. $\int \cos\sqrt{x}\,\frac{dx}{\sqrt{x}}$

20. $\int 5(4x-7)^3 dx$

21. $\int \cos^2 2y \cdot \sin 2y \; dy$

22. $\int \sec(2x+1)\tan(2x+1) \; dx$

23. $\int \sqrt{2+\sin 3t}\cos 3t \; dt$

24. $\int t^2\left(\frac{1}{2}t^3-4\right)dt$

25. $\int x(2x+5)^8 \, dx$

26. $\int x\sqrt[4]{x+1}dx$

Arc Trig Integration

Evaluate the following integrals

1. $\int \frac{1}{\sqrt{1-4x^2}}\,dx$

2. $\int \frac{1}{x^2+25}\,dx$

3. $\int \frac{x}{x^4+16}\,dx$

4. $\int \frac{1}{\sqrt{2-5x^2}}\,dx$

5. $\int \frac{3}{x\sqrt{x^2-9}}\,dx$

6. $\int \frac{x}{\sqrt{16-9x^4}}\,dx$

7. $\int \frac{1}{x\sqrt{16x^2-9}}\,dx$

8. $\int \frac{e^x}{7+e^{2x}}\,dx$

9. $\int \frac{\sin x}{\sqrt{2-\cos^2 x}}\,dx$

10. $\int \frac{1}{\sqrt{x}(1+x)}\,dx$

Trigonometric Integrals

Integrate

1. $\int \tan^3 x \sec^2 x \ dx$

2. $\int \frac{\sec^4(2t)}{\tan^9(2t)} \ dt$

3. $\int [9\sin^5(3x) - 2\cos^3(3x)]\csc^4(3x) \ dx$

4. $\int \cos^3(2x)\sin(2x) \ dx$

5. $\int \cos^4(3x)dx$

6. $\int_0^{\frac{\pi}{3}} \sin^3 x \ dx$

7. $\int \tan^2(3x)\sec^6(3x) \ dx$

8. $\int \sin^3\left(\frac{2}{3}x\right)\cos^4\left(\frac{2}{3}x\right) \ dx$

Integration by Parts

Find the Antiderivative

1. $\int te^{5t}dt$

2. $\int t^2e^{5t}dt$

3. $\int pe^{-0.1p}dp$

4. $\int t\sin t\ dt$

5. $\int y\ln y\ dy$

6. $\int x^3\ln x\ dx$

7. $\int (z+1)e^{2z}\ dz$

8. $\int \frac{z}{e^z}dz$

9. $\int t^2 \sin t \ dt$

10. $\int \theta^2 \cdot \cos 3\theta \ d\theta$

11. $\int \sin^2 \theta \ d\theta$

12. $\int (\theta + 1) \sin(\theta + 1) \ d\theta$

13. $\int \cos^2(3x + 1) dx$

14. $\int \frac{\ln x}{x^2} dx$

15. $\int q^5 \ln 5q \ dq$

16. $\int y \sqrt{y + 3} \, dy$

17. $\int x^3 e^{x^2}\, dx$

18. $\int x^5 \cos x^3 \; dx$

19. $\int e^{2x} \cos x \; dx$

20. $\int e^{-x} \cos 2x \; dx$

21. $\int e^{3x} \sin(-x) \; dx$

22. $\int 2 \cdot e^{3x} \cos(-3x) \; dx$

Integration Using Partial Fractions

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

2. $\int \frac{3x^3-5x^2-11x+9}{x^2-2x-3}\,dx$

3. $\int \frac{x^2+12x-5}{(x+1)^2}\,dx$

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

5. $\int \frac{4x^3+2x^2+1}{(4x^3-x)}\,dx$

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

7. $\int \frac{6x^2-x-1}{3x-1}\,dx$

8. $\int \frac{3x+5}{x^2+4x-32}\,dx$

9. $\int \frac{1}{x^2-4}\,dx$

10. $\int \frac{2x+3}{x^2-9}\,dx$

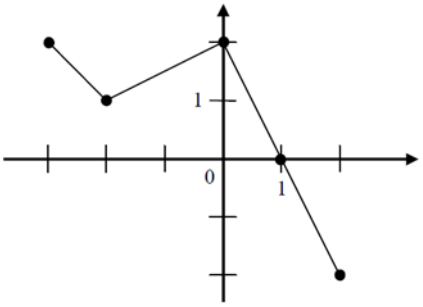
Integration Rules – Practice Test

Multiple Choice.

1. $\int \sec^2 x \ dx =$

a. $\tan x + c$
b. $\csc^2 x + c$
c. $\cos^2 x + c$
d. $\frac{\sec^3 x}{3} + c$
e. $2\sec^2 x \tan x + c$

2. The graph of the piecewise linear function f is shown in the figure. If $g(x) = \int_{-2}^{x} f(t)dt$, which of the following values is greatest?



Graph of f

a. $g(-3)$
b. $g(-2)$
c. $g(0)$
d. $g(1)$
e. $g(2)$

3. $\int \frac{x}{x^2-4} \ dx =$

a. $-\frac{1}{4(x^2-4)^2} + c$
b. $\frac{1}{2(x^2-4)^2} + c$
c. $\frac{1}{2}\ln|x^2 - 4| + c$
d. $2\ln|x^2 - 4| + c$
e. $\frac{1}{2}\arctan\left(\frac{x}{2}\right) + c$

4. $\int_0^1 \frac{1}{e^{4x}} \ dx$

a. $-\frac{e^{-4}}{4}$
b. $-4e^{-4}$
c. $e^{-4} - 1$
d. $\frac{1}{4} - \frac{e^{-4}}{4}$
e. $4 - 4e^{-4}$

5. $\int_0^{\frac{\pi}{4}} \sin x \ dx$

a. $\frac{\sqrt{2}}{2}$
b. $-\frac{\sqrt{2}}{2}$
c. $-\frac{\sqrt{2}}{2} - 1$
d. $-\frac{\sqrt{2}}{2} + 1$
e. $\frac{\sqrt{2}}{2} - 1$

6. Using the substitution $u = 2x + 1$, $\int_0^2 \sqrt{2x+1}\, dx$ is equivalent to

a. $\frac{1}{2}\int_{-\frac{1}{2}}^{\frac{1}{2}} \sqrt{u}\, du$
b. $\frac{1}{2}\int_0^2 \sqrt{u}\, du$
c. $\frac{1}{2}\int_1^5 \sqrt{u}\, du$
d. $\int_0^2 \sqrt{u}\, du$
e. $\int_1^5 \sqrt{u}\, du$

7. $\int_1^e \frac{x^2-1}{x}\, dx$

a. $e^2 - 1$
b. $e^2 - 2$
c. $\frac{e^2}{2} + \frac{1}{2}$
d. $\frac{e^2}{2} - \frac{1}{2}$
e. $\frac{e^2}{2} - \frac{3}{2}$

8. $\int x^2 \cdot \cos(x^3) dx$

a. $-\frac{1}{3}\sin(x^3) + c$
b. $\frac{1}{3}\sin(x^3) + c$
c. $-\frac{x^3}{3}\sin(x^3) + c$
d. $\frac{x^3}{3}\sin(x^3) + c$
e. $\frac{x^3}{3}\sin\left(\frac{x^4}{4}\right) + c$

9. $\int x \cdot \sin(2x) dx$

a. $-\frac{x}{2}\cos(2x) + \frac{1}{4}\sin(2x) + c$
b. $-\frac{x}{2}\cos(2x) - \frac{1}{4}\sin(2x) + c$
c. $\frac{x}{2}\cos(2x) - \frac{1}{4}\sin(2x) + c$
d. $-2x\cos(2x) + \sin(2x) + c$
e. $-2x\cos(2x) - 4\sin(2x) + c$

10. $\int \frac{3x^2}{\sqrt{x^3+1}} dx =$

a. $2\sqrt{x^3+1} + c$
b. $\frac{3}{2}\sqrt{x^3+1} + c$
c. $\sqrt{x^3+1} + c$
d. $\ln\sqrt{x^3+1} + c$
e. $\ln(x^3+1) + c$

11. $\int (x^2+1)^2\, dx =$

a. $\frac{(x^2+1)^3}{3} + c$
b. $\frac{(x^2+1)^3}{6x} + c$
c. $\left(\frac{x^3}{3} + x\right)^2 + c$
d. $\frac{2x(x^2+1)^3}{3} + c$
e. $\frac{x^5}{5} + \frac{2x^3}{3} + x + c$

12. $\int_0^{\sqrt{3}} \frac{dx}{\sqrt{4-x^2}} =$

a. $\frac{\pi}{3}$
b. $\frac{\pi}{6}$
c. $2-\sqrt{3}$
d. $\frac{1}{2}\ln 2$
e. $-\ln 2$

13. $\int xf(x)dx =$

a. $xf(x) - \int xf'(x)dx$
b. $\frac{x^2}{2}f(x) - \int \frac{x^2}{2}f'(x)dx$
c. $xf(x) - \frac{x^2}{2}f(x) + C$
d. $xf(x) - \int f'(x)dx$
e. $\frac{x^2}{2}\int f(x)dx$

14. $\int(\sin(2x) + \cos(2x))dx =$

a. $\frac{1}{2}\cos(2x) + \frac{1}{2}\sin(2x) + c$
b. $-\frac{1}{2}\cos(2x) + \frac{1}{2}\sin(2x) + c$
c. $\frac{1}{2}\cos(2x) - \frac{1}{2}\sin(2x) + c$
d. $2\cos(2x) - 2\sin(2x) + c$
e. $-2\cos(2x) + 2\sin(2x) + c$

15. $\int \frac{x}{1+9x^4}dx$

a. $\frac{1}{36x^2}\ln|1+9x^4| + c$
b. $\frac{1}{36x^3}\ln|1+9x^4| + c$
c. $\frac{1}{6}\arctan(3x^2) + c$
d. $\frac{1}{18}\arctan(9x^2) + c$
e. $\arctan(3x^2) + c$

Integrate:

16. $\int \frac{\csc^2\sqrt{x}}{\sqrt{x}}\,dx$

17. $\int \frac{(\ln x)^4}{x}dx$

18. $\int \frac{3x^3-39x+20}{x+4}\ dx$

19. $\int \sin^3(2x)\ dx$

20. $\int \arctan x\ dx$

21. $\int x^3 \sin(2x)\ dx$

22. $\int \cos(3x)\sin^8(3x)dx$

23. $\int \tan(4x)dx$

24. $\int x(2-x)^{\frac{2}{3}}\ dx$

25. $\int \frac{5x-4}{2x^2+x-1}\ dx$

26. $\int e^{3x} \sin(2x) dx$

27. $\int \sin^2(5x) dx$

28. $\int \sec^2 x \tan^2 x \ dx$

29. $\int r^4 \ln r \ dr$

30. $\int e^{2x} \sec(e^{2x}) \tan(e^{2x})$

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