AP Calculus

Name_____
Integration Day 12

Integrate each: You should have these 100% memorized tonight. If you wait until the night before the test you will make mistakes. Do not lose these easy points!!!!

1. $\int x^n\,dx$	2. $\int b^x\,dx$	3. $\int \sin x\,dx$	4. $\int \cos x\,dx$
5. $\int \sec^2 x\,dx$	6. $\int \csc^2 x\,dx$	7. $\int \sec x \tan x\,dx$	8. $\int \csc x \cot x\,dx$
9. $\int e^x\,dx$	10. $\int \tan x\,dx$	11. $\int \cot x\,dx$	12. $\int \sec x\,dx$
13. $\int \csc x\,dx$	14. $-\int_a^b f(x)\,dx$	15. $\int_a^a f(x)\,dx$	16. $d/dx \int_{\text{constant}}^{x} f(t)\,dt$
17. $\int \frac{1}{\sqrt{1-x^2}}\,dx$	18. $\int \frac{1}{x^2+1}\,dx$	19. $\int \frac{1}{\lvert x\rvert\sqrt{x^2-1}}\,dx$	20. $\int \frac{1}{x}\,dx$

Integrate each:

1. $\int 5^x\,dx$

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

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

4. $\int \sec 5x \tan 5x\,dx$

5. $\int x^3 - 6x^2 + 8x - 2\,dx$

6. $\int x\sqrt{2x-1}\,dx$

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

8. $\int \frac{x\,dx}{\sqrt{49-x^2}}$

9. $\int \cos\frac{x}{2}\,dx$

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10. $\int 10^x \, dx$

11. $\int \frac{x}{4+x^2} dx$

12. $\int \frac{x^2-7}{x^2+1} dx$

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

14. $\int \frac{4x\,dx}{4+x^2}$

15. $\int \frac{5x}{\sqrt{25-x^2}} dx$

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

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

18. $\int \tan\left(\frac{x}{2}\right) dx$

19. $\int_{-5}^{5} \left|x^2-x-6\right| dx$

Set up Only!
DO NOT INTEGRATE

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

21. $\int \sin 3x\,dx$

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

23. $\int \frac{dx}{9+x^2}$

24. $\int \frac{5\,dx}{\sqrt{10-x^2}}$

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

26. $\int \sec^2 x\left(8\tan^3 x - 6\tan^2 x - 12\tan x\right) dx$

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

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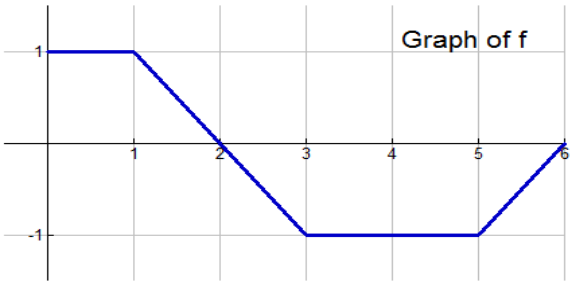
28. The graph of f is shown to the right.

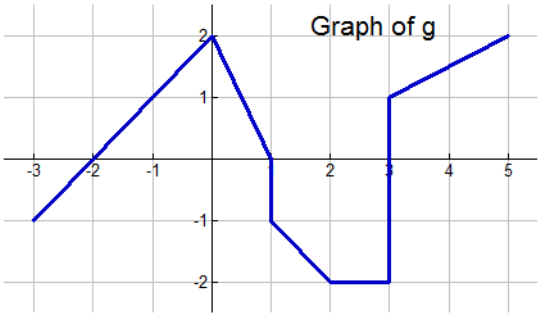


a) Find the area bound by the curve and the x-axis over the interval [0,2].
AKA $\int_0^2 f(x)dx$

b.) Find the area bound by the curve and the x-axis over the interval [2,6].
AKA $\int_2^6 f(x)dx$

c.) Find the area bound by the curve and the x-axis over the interval [0,6].
AKA $\int_0^6 f(x)dx$

29. The graph of g is shown to the right.



a.) $\int_{-3}^{-2} g(x)dx$

b.) $\int_{-2}^{1} g(x)dx$

c.) $\int_{1}^{3} g(x)dx$

d.) $\int_{3}^{5} g(x)dx$

e.) $\int_{-3}^{0} g(x)dx$

f.) $\int_{0}^{5} g(x)dx$

g.) $\int_{-3}^{5} g(x)dx$

h.) $\int_{-3}^{-3} g(x)dx$

i.) $\int_{3}^{1} g(x)dx$

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30. A car comes to a stop five seconds after the driver slams on the brakes. While the brakes are on, the following velocities are recorded.

Time since brakes applied (sec)	0	1	2	3	4	5
Velocity (ft/sec)	88	60	40	25	10	0

Estimate the distance the car traveled after the brakes were applied.

a.) Using a Left-Riemann sum with five subintervals of equal length and values from the table to approximate $\int_0^5 v(t)dt$.

b.) Using a Right-Riemann sum with five subintervals of equal length and values from the table to approximate $\int_0^5 v(t)dt$.

c.) Using a Trapezoidal sum with five subintervals of equal length and values from the table to approximate $\int_0^5 v(t)dt$. Using correct units, explain the meaning of $\int_0^5 v(t)dt$ in the context of this problem.

31. Roger decides to run a marathon. Roger's friend Jeff rides behind him on a bicycle and clocks his pace every 15 minutes. Roger starts out strong, but after an hour and a half he is so exhausted that he has to stop. The data Jeff collected is summarized below.

Time spend running (min)	0	15	30	45	60	75	90
Speed (meters/minute)	12	11	10	10	8	7	0

a.) Estimate the distance that Roger ran during the first 30 minutes using a Trapezoidal sum with two subinterval of equal length and values from the table.

b.) Estimate the total distance that Roger ran during the first 90 minutes using a Trapezoidal sum with **three** subinterval of equal length and values from the table.

c.) Estimate the total distance that Roger ran during the first 90 minutes using a Midpoint sum with three subinterval of equal length and values from the table.

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Answers:

1) $\frac{x^{n+1}}{n+1}+C$
2) $\frac{b^x}{\ln b}+C$
3) $-\cos(x)+C$
4) $\sin(x)+C$
5) $\tan(x)+C$
6) $-\cot(x)+C$
7) $\sec(x)+C$
8) $-\csc(x)+C$
9) e^x+C
10) $\ln\left|\sec(x)\right|+C$
11) $\ln\left|\sin(x)\right|+C$
12) $\ln\left|\sec(x)+\tan(x)\right|+C$
13) $\ln\left|\csc(x)-\cot(x)\right|+C$
13) $\int_b^a f(x)dx$
15) 0
16) $f(x)$
17) $\sin^{-1}(x)+C$
18) $\tan^{-1}(x)+C$
19) $\sec^{-1}(x)+C$
20) $\ln\left|x\right|+C$

1) $\frac{5^x}{\ln 5}+C$
2) $\frac{1}{2}e^{2x}+C$
3) $-\ln\left|4-x\right|+C$
4) $\frac{1}{5}\sec(5x)+C$
5) $\frac{1}{4}x^4-2x^3+4x^2-2x+C$
6) $\frac{1}{10}(2x-1)^{\frac{5}{2}}+\frac{1}{6}(2x-1)^{\frac{3}{2}}+C$
7) $x-\tan^{-1}(x)+C$
8) $-\sqrt{49-x^2}+C$
9) $2\sin\left(\frac{x}{2}\right)+C$
10) $\frac{10^x}{\ln 10}+C$
11) $\frac{1}{2}\ln\left(4+x^2\right)+C$
12) $x-8\tan^{-1}(x)+C$
13) $\frac{x^2}{2}+3\ln\left|x\right|+C$
14) $2\ln\left(4+x^2\right)+C$
15) $-5\sqrt{25-x^2}+C$
16) $3\tan^{-1}(x)-\frac{1}{2}\ln\left(x^2+1\right)+C$
17) $\frac{1}{9}(\sin 3x)^3+C$
18) $2\ln\left|\sec\left(\frac{x}{2}\right)\right|+C$
19) *let* $f(x)=x^2-x-6$
$\int_{-5}^{-2}f(x)dx-\int_{-2}^{3}f(x)dx+\int_{3}^{5}f(x)dx$
20) $\frac{3}{5}x^{\frac{5}{3}}-\frac{9}{4}x^{\frac{4}{3}}+2x^2-3x^{\frac{2}{3}}+C$
21) $-\frac{\cos(3x)}{3}+C$
22) $\frac{3}{14}(2x-5)^{\frac{7}{3}}+C$
23) $\frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right)+C$
24) $5\sin^{-1}\left(\frac{x}{\sqrt{10}}\right)+C$
25) $\frac{(\ln x)^5}{5}+C$
26) $2\tan^4 x-2\tan^3 x-6\tan^2 x+C$
27) $\frac{4}{9}(x+1)^{\frac{9}{4}}-\frac{4}{5}(x+1)^{\frac{5}{4}}+C$

28) a. $\frac{3}{2}$ b. -3 c. $-\frac{3}{2}$

29) a. $-\frac{1}{2}$ b. 3 c. $-\frac{7}{2}$ d. 3 e. $\frac{3}{2}$ f. $\frac{1}{2}$ g. 2 h. 0 i. $\frac{7}{2}$

30) a. 233 *feet* b. 135 *feet* c. 179 *feet*

31) a. 330 *meters* b. 720 *meters* c. 840 *meters*