

AP Calculus AB
Friday, January 4, 2013

Any questions on the exam?
Unit 2 MMM

Go over HW... you will be putting problems on the board

Retakes by next Friday. Let me know which one by TODAY.

find $f'(x)$ for each:

① $f(x) = x^2$

② $f(x) = x^2 + 3$

③ $f(x) = x^2 + e$

④ $f(x) = x^2 - \sqrt{7}$

$f'(x) = 2x$

Integration/Antidifferentiation

"inverse" of differentiation

Ex. $\int 2x dx = x^2 + C$
↑ constant of integration

Ex. $\int 3x^2 dx = x^3 + C$
 $\frac{3x^{2+1}}{3} \quad 3x^{3-2}$

Ex. $\int x^5 dx = \frac{x^{5+1}}{6} + C$
 $= \frac{1}{6}x^6 + C$

1. $\int -9 dx$

2. $\int -5x dx$

3. $\int (6+2x) dx$

4. $\int x^2 dx$

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

6. $\int (3x^3 - 4x^2) dx$
Daniel

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

8. $\int (\frac{3}{x^2}) dx$
Chloe

9. $\int (2 - \frac{1}{x^3} + \frac{7}{x^2}) dx$
Jong

10. $\int 5\sqrt{x} dx$
Oli

11. $\int 5(\sqrt[3]{x}) dx$

12. $\int (x^{3/4} - \frac{1}{x^{3/4}}) dx$
Madison

$$\int (3x^3 - 4x^2) dx = \frac{3x^4}{4} - \frac{4x^3}{3} + C$$

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

$$\frac{2}{3} \cdot \frac{x^6}{6} - \frac{5}{2} \cdot \frac{x^2}{2} + \frac{1}{2} \cdot \frac{x}{1}$$

$$\frac{x^6}{9} - \frac{5x^2}{4} + \frac{x}{2} + C$$

$$\int \frac{3}{x^4} dx = \int 3x^{-4} dx = \frac{3x^{-3}}{-3} = \frac{-1}{x^3} + C$$

$$\int (2 - \frac{1}{x^5} + \frac{7}{x^3}) dx = \int (2 - x^{-5} + 7x^{-3}) dx$$

$$= 2x + \frac{x^{-4}}{-4} + \frac{7x^{-2}}{-2} + C$$

$$= 2x + \frac{1}{4x^4} - \frac{7}{2x^2} + C$$

$$\int 5\sqrt{x} dx = \int 5x^{1/2} dx$$

$$= \frac{5x^{3/2}}{3/2} + C$$

$$\int (x^{3/4} - \frac{1}{x^{3/4}}) dx$$

$$\int (x^{3/4} - x^{-3/4}) dx$$

$$\frac{x^{7/4}}{7/4} - \frac{x^{1/4}}{1/4} + C$$

$$\frac{4x^{7/4}}{7} - 4x^{1/4} + C$$

Evaluate:

$$\textcircled{1} \int (t^4 + t - 2) dt$$

$$\textcircled{2} \int \left(\frac{3}{5}x^4 + \frac{4}{3}x^2 - \frac{x}{3} \right) dx$$

$$\textcircled{3} \int \frac{1}{x^3} dx$$

$$\textcircled{4} \int (3\sqrt{y} - 2\sqrt[3]{y}) dy$$

16) $\int (2x-3)^2 dx$

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

18) $\int \frac{(2x-5)(3x+2)}{\sqrt{x}} dx$

expand

$$\int (4x^2 - 12x + 9) dx$$

$$= \frac{4x^3}{3} - \frac{12x^2}{2} + 9x + C$$

$$= \frac{4x^3}{3} - 6x^2 + 9x + C$$

Divide

$$\int (x^{-2} + 3x^{-3} + x^{-4}) dx$$

$$= \frac{x^{-1}}{-1} + \frac{3x^{-2}}{-2} + \frac{x^{-3}}{-3} + C$$

$$= -\frac{1}{x} - \frac{3}{2x^2} - \frac{1}{3x^3} + C$$

$$\int \frac{(2x-5)(3x+2)}{\sqrt{x}} dx$$

$$= \int \frac{6x^2 - 11x - 10}{x^{1/2}} dx$$

$$= \int (6x^{3/2} - 11x^{1/2} - 10x^{-1/2}) dx$$

$$= \frac{6x^{5/2}}{5/2} - \frac{11x^{3/2}}{3/2} - \frac{10x^{1/2}}{1/2} + C$$

$$= \frac{12x^{5/2}}{5} - \frac{22x^{3/2}}{3} - 20x^{1/2} + C$$

$$\frac{d}{dx} [\sin x] = \cos x$$

$$\int \cos x dx = \sin x + C$$

$$\frac{d}{dx} [\cos x] = -\sin x$$

$$\int \sin x dx = -\cos x + C$$

$$\frac{d}{dx} [\tan x] = \sec^2 x$$

$$\int \sec^2 x dx = \tan x + C$$

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Examples - find the integral of each of the following:

20) $\int 4 \sin x \, dx$
 $-4 \cos x + C$

21) $\int \frac{-2 \cos x}{3} \, dx$
 $-\frac{2}{3} \sin x + C$

22) $\int \frac{5}{\cos^2 x} \, dx$
 $= \int 5 \sec^2 x \, dx$
 $= 5 \tan x + C$

23) $\int (4 \cos x - 9 \sin x) \, dx$
 $= 4 \sin x - 9(-\cos x) + C$
 $= 4 \sin x + 9 \cos x + C$

24) $\int \left(\frac{-\sin x}{\cos^2 x} \right) \, dx$

25) $\int (\theta^2 - 2 \csc^2 \theta) \, d\theta$

MasterMathMentor.com - 122 - Stu Schwartz

If you were given the statement that $\frac{dy}{dx} = 4x$, we can cross multiply to get $dy = 4x \, dx$. We can now integrate each side of the equation to get $\int dy = \int 4x \, dx$. From there, we can solve for y .

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

$$= \int \left[\frac{\sin x}{\cos x} \cdot \frac{1}{\cos x} \right] \, dx$$

$$= \int (-\tan x \cdot \sec x) \, dx$$

$$= -\sec x + C$$

13. $\int 3\sqrt[3]{x^2} dx$

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

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

16. $\int \frac{x^3 - 4x - 1}{2x^3} dx$

17. $\int t^2(3+t)^2 dt$

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

19. $\int \frac{3\cos x}{5} dx$

20. $\int (1 - 6\cos x) dx$

21. $\int \left(\frac{1}{x^2} - \sin x \right) dx$

22. $\int (\sec^2 t + \cos t + 1) dt$

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

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