

AP Calculus

Name: Key
Period: Date:

Review 6.1 & 6.2

Show your work on a separate sheet of paper.

I. Know your indefinite integrals formulas; find the followings:

- $\int e^{-5x} dx = \frac{1}{-5} e^{-5x} + C$
- $\int \cos \frac{x}{3} dx = 3 \sin \left(\frac{x}{3} \right) + C$
- $\int 10x(\sqrt{x}+2) dx = 4x^{\frac{5}{2}} + 10x^2 + C$
- $\int \left(\frac{3}{x-3} + \frac{4}{x} \right) dx = 3 \ln|x-3| + 4 \ln|x| + C$
- $\int \frac{1+\cos 2x}{2} dx = \frac{1}{2}x + \frac{1}{4} \sin(2x) + C$
- $\int \sec^2 x dx = \tan x + C$
- $\int \sin 5x dx = -\frac{1}{5} \cos(5x) + C$
- $\int \frac{2}{1+x^2} dx = 2 \tan^{-1} x + C$

II. Solve these differential equations (with given initial value).

9. $\frac{dy}{dx} = \frac{1}{x^2} + x$; $y(2) = 1$

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

10. $v = 9.8t + 5$; $s(0) = 10$

v: velocity; s: position

$$s = 4.9t^2 + 5t + 10$$

II. Solve using "U"-Substitution.

11. $\int \cos(3x+5) dx = \frac{1}{3} \sin(3x+5) + C$

12. $\int \cos^4 x \sin x dx = -\frac{\cos^5 x}{5} + C$

13. $\int \sqrt{x^2+4x(x+2)} dx = \frac{1}{3} (x^2+4x)^{\frac{3}{2}} + C$

14. $\int \frac{dx}{x^2+16} = \frac{1}{4} \tan^{-1} \left(\frac{x}{4} \right) + C$

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

16. $\int_{-1}^1 \frac{3r}{(4+r^2)^2} dr = 0$

17. $\int_2^9 6xe^{x^2} dx = 3(e^9 - e^4)$

18. $\int_{-\pi}^{\pi} \frac{\cos x}{\sqrt{4+3 \sin x}} dx = 0$

IV. Solve these differential equations.

19. $\frac{dy}{dx} = 3y$

$$y = Ae^{3x}$$

20. $\frac{dy}{dx} = \sin x e^{y+\cos x}$

$$y = -\ln(e^{\cos x} + C)$$

21. $\frac{dy}{dx} = \frac{4\sqrt{y} \ln x}{x}$

$$y = \left[(\ln x)^2 + \frac{C}{2} \right]^2$$