AP Calculus AB

Basic Integration

1) $f(x) = 4x^3$

$\int 4x^3 dx = x^4 + C$

2) $f(x) = \sin(2x)$

$\int \sin(2x) dx$

$-\frac{1}{2}\cos(2x) + C$

3) $\int 9\sec^2 x \, dx$

$\boxed{9\tan x + C}$

4) $f(y) = \frac{-12}{y^3}$

$\int -12y^{-3} dy$

$\boxed{6y^{-2} + C}$

5) $f(x) = 2e^x$

$\int 2e^x dx$

$\boxed{2e^x + C}$

6) $\int (7x^{20} - 2x^5) dx$

$\boxed{\frac{1}{3}x^{21} - \frac{1}{3}x^6 + C}$

7) $\int (9x^{-1/2} + 9x^{1/2}) dx$

$\frac{9x^{1/2}}{1/2} + \frac{9x^{3/2}}{3/2} + C$

$\boxed{18x^{1/2} + 6x^{3/2} + C}$

8) $\int (4t^{-2} + 5t^6) dt$

$\boxed{-4t^{-1} + \frac{5}{7}t^7 + C}$

9) $\int (3x+2)^2 dx$

$\boxed{\frac{1}{9}(3x+2)^3 + C}$

check:

$3(3x+2)^2 \cdot 3$

10) $\int (4x^{1/3} + 3x^{-1/3} + 9) dx$

$\frac{4x^{4/3}}{4/3} + \frac{3x^{2/3}}{2/3} + 9x + C$

$\boxed{3x^{4/3} + \frac{9}{2}x^{2/3} + 9x + C}$

11) $\int \frac{4x^5 + 10x^3}{x^2} dx$

$\int (4x^5 + 10x^3)x^{-2} dx$

$\int (4x^3 + 10x) dx$

$\boxed{x^4 + 5x^2 + C}$

12) $\int (\sin 3y + \cos 7y) dy$

$\boxed{-\frac{1}{3}\cos 3y + \frac{1}{7}\sin 7y + C}$

13) $\int(-2\sec x\tan x - 5\sec^2 x)\,dx$

$\boxed{-2\sec x - 5\tan x + C}$

14) $\int(e^{2x} + 7x^{1/2})\,dx$

$\boxed{\frac{1}{2}e^{2x} + \frac{14}{3}x^{3/2} + C}$

15) $\int \frac{6+u}{u}\,du$

$\int(6+u)\cdot u^{-1}\,du$

$\int(6u^{-1} + 1)\,du$

$\boxed{6\ln|u| + u + C}$

16) $\int \frac{16t^8+6}{t}\,dt$

$\int(16t^8+6)\cdot t^{-1}\,dt$

$\int(16t^7 + 6t^{-1})\,dt$

$\boxed{\frac{8}{3}t^6 + 6\ln|t| + C}$

17) $g(x) = \begin{cases} (x+4)^2, & x \le -3 \\ 2x+7, & -3 < x < 4 \\ (5-x)^2, & x \ge 4 \end{cases}$

$x = -3$ — continuity

I. $g(-3) = 1$

II. $\lim_{x\to -3^-} g(x) = 1$, $\lim_{x\to -3^+} g(x) = 1$ $\Big\}$ $\lim_{x\to -3} g(x) = 1$

III. $g(-3) = \lim_{x\to -3} g(x)$

Diff

$\frac{d}{dx}\left[(x+4)^2\right]\Big|_{x=-3} = 2(x+4)\Big|_{x=-3} = 2$

$\frac{d}{dx}(2x+7)\Big|_{x=-3} = 2$

$x = 4$

I. $g(4) = 1$

II $\lim_{x\to 4^-} g(x) = 15 \neq \lim_{x\to 4^+} g(x) = 1$

$g(x)$ is not cont @ $x=4$ which means $g(x)$ is not diff @ $x=4$.