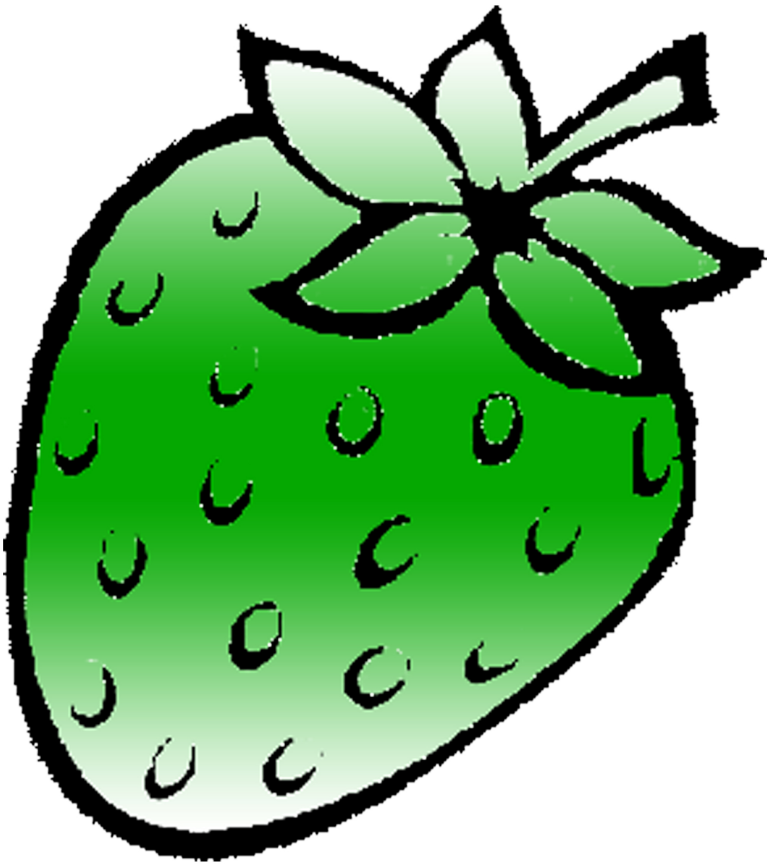
STRAWBERRY



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1. Some standard formulae:

➢ Integration:

1. $\int x^n dx = \frac{x^{n+1}}{n+1}$, $n \neq -1$

2. $\int e^x dx = e^x$

3. $\int a^x dx = \frac{a^x}{\log a}$

4. $\int \frac{1}{x} dx = \log x$

5. $\int \sin x \, dx = -\cos x$

6. $\int \cos x \, dx = \sin x$

7. $\int \tan x \, dx = -\log(\cos x) = \log(\sec x)$

8. $\int \cot x \, dx = \log(\sin x)$

9. $\int \sec^2 x \, dx = \tan x$

10. $\int \cos ec^2 x \, dx = -\cot x$

11. $\int \sec x \, \tan x \, dx = \sec x$

12. $\int \cos ec \, x \cot x \, dx = -\cos ecx$

13. $\int \sec x \, dx = \log(\sec x + \tan x) = \log\left[\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right]$

14. $\int \cos ec \, x \, dx = \log(\cos ec \, x - \cot x) = \log\left[\tan\left(\frac{x}{2}\right)\right]$

15. $\int \frac{1}{\sqrt{x^2 - a^2}} dx = \log\left(x + \sqrt{x^2 - a^2}\right)$

16. $\int \frac{1}{\sqrt{x^2 + a^2}} dx = \log\left(x + \sqrt{x^2 + a^2}\right) = \sinh^{-1}\left(\frac{x}{a}\right)$

17. $\int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1}\left(\frac{x}{a}\right)$

18. $\int \frac{1}{a^2 - x^2} dx = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right) = \tanh^{-1}\left(\frac{x}{a}\right)$

19. $\int \frac{1}{a^2 + x^2} dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)$

20. $\int \frac{1}{x^2 - a^2} dx = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)$

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

22. $\int \sqrt{x^2 - a^2} dx = \frac{x}{2}\sqrt{x^2 - a^2} - \frac{a^2}{2}\log\left(x + \sqrt{x^2 - a^2}\right)$

23. $\int \sqrt{x^2 + a^2} dx = \frac{x}{2}\sqrt{x^2 + a^2} + \frac{a^2}{2}\log\left(x + \sqrt{x^2 + a^2}\right)$

➢ Derivatives:

- $\frac{d}{dx}c = 0$ where c is constant
- $\frac{d}{dx}x^n = nx^{n-1}$

- $\frac{d}{dx}\sin x = \cos x$
- $\frac{d}{dx}\cos x = -\sin x$
- $\frac{d}{dx}\tan x = \sec^2 x$
- $\frac{d}{dx}\cot x = -\csc^2 x$
- $\frac{d}{dx}\csc x = -\csc x \cot x$
- $\frac{d}{dx}\sec x = \sec x \tan x$

- $\frac{d}{dx}Sin^{-1}x = \frac{1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}Cos^{-1}x = \frac{-1}{\sqrt{1-x^2}}$
- $\frac{d}{dx}Tan^{-1}x = \frac{1}{1+x^2}$
- $\frac{d}{dx}Cot^{-1}x = \frac{-1}{1+x^2}$
- $\frac{d}{dx}Sec^{-1}x = \frac{1}{x\sqrt{x^2-1}}$
- $\frac{d}{dx}Csc^{-1}x = \frac{-1}{x\sqrt{x^2-1}}$

- $\frac{d}{dx}a^x = a^x \ln a$
- $\frac{d}{dx}e^x = e^x$
- $\frac{d}{dx}\log_a x = \frac{1}{x \ln a}$
- $\frac{d}{dx}\ln x = \frac{1}{x}$

- $\frac{d}{dx}\sinh x = \cosh x$
- $\frac{d}{dx}\cosh x = \sinh x$
- $\frac{d}{dx}\tanh x = \operatorname{sech}^2 x$
- $\frac{d}{dx}\coth x = -\operatorname{csch}^2 x$
- $\frac{d}{dx}\operatorname{sech} x = -\operatorname{sech} x \tanh x$
- $\frac{d}{dx}\operatorname{csch} x = -\operatorname{csch} x \coth x$

- $\frac{d}{dx}Sinh^{-1}x = \frac{1}{\sqrt{x^2+1}}$
- $\frac{d}{dx}Cosh^{-1}x = \frac{1}{\sqrt{x^2-1}}$
- $\frac{d}{dx}Tanh^{-1}x = \frac{1}{1-x^2}$
- $\frac{d}{dx}Coth^{-1}x = \frac{1}{1-x^2}$
- $\frac{d}{dx}Sech^{-1}x = \frac{-1}{x\sqrt{1-x^2}}$
- $\frac{d}{dx}Csch^{-1}x = \frac{-1}{x\sqrt{1+x^2}}$

2. Some useful results:

1. $\int e^{ax} \sin bx \, dx = \frac{e^{ax}}{a^2+b^2}(a \sin bx - b \cos bx)$

2. $\int e^{ax} \cos bx \, dx = \frac{e^{ax}}{a^2+b^2}(a \cos bx + b \sin bx)$

3. $\int_{-a}^{a} f(x)\,dx = \begin{cases} 0 & \text{If } f(x) \text{ is odd, i.e. } f(-x) = -f(x) \\ 2\int_0^a f(x)\,dx & \text{If } f(x) \text{ is even, i.e. } f(-x) = f(x) \end{cases}$

4. $\int_0^{2a} f(x)\,dx = \int_0^a f(x)\,dx + \int_0^a f(2a-x)\,dx$

5. $\int_0^{2a} f(x)\,dx = 2\int_0^a f(x)\,dx$ If $f(x) = f(2a-x)$

6. $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$

7. $\int uv\,dx = u\int v\,dx - \int\left[\frac{du}{dx}.\int v\,dx\right]dx$ .....Rule for Integration by parts

8. $\int uv\,dx = uv_1 - u'v_2 + u''v_3 - u'''v_4 + u^{(4)}v_5 - .....$ Generalized rule for Integration by parts

where $v_1 = \int v\,dx$, $v_2 = \int v_1\,dx$, $v_3 = \int v_2\,dx$ ..... and so on

$u' = \frac{du}{dx}$, $u'' = \frac{d^2u}{dx^2}$, $u''' = \frac{d^3u}{dx^3}$ .....and so on

Note that above rule is applicable only if one of the function is algebric function (u).

9. $\int \frac{f'(x)}{f(x)}\,dx = \log f(x)$

10. $\int \frac{f'(x)}{\sqrt{f(x)}}\,dx = 2\sqrt{f(x)}$

11. $\int e^{f(x)} f'(x)\,dx = e^{f(x)}$

12. $\int e^x\left[f(x) + f'(x)\right]dx = e^x f(x)$

13. $\int \sqrt{f(x)}\,.f'(x)\,dx = \frac{2}{3}\left[f(x)\right]^{2/3}$

14. $\int f^n(x).f'(x)\,dx = \frac{\left[f(x)\right]^{n+1}}{n+1}, n \neq -1$