דף נוסחאות/ מתמטיקה לפיזיקאים

טריגונומטריה

1. $\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

2. $\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

3. $\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

4. $\sin 2\alpha = 2\sin\alpha\cos\alpha$

5. $\tan(\alpha \pm \beta) = \dfrac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$

6. $\tan 2\alpha = \dfrac{2\tan\alpha}{1 - \tan^2\alpha}$

7. $\cos\alpha + \cos\beta = 2\cos\left(\dfrac{\alpha+\beta}{2}\right)\cos\left(\dfrac{\alpha-\beta}{2}\right)$

8. $\cos\alpha\cos\beta = \dfrac{1}{2}\left[\cos(\alpha-\beta) + \cos(\alpha+\beta)\right]$

9. $\cos\alpha - \cos\beta = -2\sin\left(\dfrac{\alpha+\beta}{2}\right)\sin\left(\dfrac{\alpha-\beta}{2}\right)$

10. $\sin\alpha\sin\beta = \dfrac{1}{2}\left[\cos(\alpha-\beta) - \cos(\alpha+\beta)\right]$

11. $\sin\alpha \pm \sin\beta = 2\sin\left(\dfrac{\alpha \pm \beta}{2}\right)\cos\left(\dfrac{\alpha \mp \beta}{2}\right)$

12. $\sin\alpha\cos\beta = \dfrac{1}{2}\left[\sin(\alpha-\beta) + \sin(\alpha+\beta)\right]$

13. $\tan\alpha \pm \tan\beta = \dfrac{\sin(\alpha \pm \beta)}{\cos\alpha\cos\beta}$

14. $1 + \tan^2\alpha = \sec^2\alpha$

15. $1 + \cot^2\alpha = \csc^2\alpha$

16. $\sin^2\dfrac{\alpha}{2} = \dfrac{1}{2}(1 - \cos\alpha)$

17. $\cos^2\dfrac{\alpha}{2} = \dfrac{1}{2}(1 + \cos\alpha)$

18. $\tan^2\dfrac{\alpha}{2} = \dfrac{1-\cos\alpha}{1+\cos\alpha}$

19. $\sin^4\alpha + \cos^4\alpha = 1 - \dfrac{1}{2}\sin^2 2\alpha$

20. $\sin^6\alpha + \cos^6\alpha = 1 - \dfrac{3}{4}\sin^2 2\alpha$

21. $\cosh^2\alpha - \sinh^2\alpha = 1$

22. $1 - \tanh^2\alpha = \cosh^{-2}\alpha$

23. $\coth^2\alpha - 1 = \sinh^2\alpha$

דיפרנציאלים

1. $\dfrac{d}{dx}\left(x^n\right) = nx^{n-1}$

2. $\dfrac{d}{dx}(\sin x) = \cos x$

3. $\dfrac{d}{dx}(\cos x) = -\sin x$

4. $\dfrac{d}{dx}\left(tgx\right) = \dfrac{1}{\cos^2 x}$

5. $\dfrac{d}{dx}(\cot x) = -\dfrac{1}{\sin^2 x}$

6. $\dfrac{d}{dx}(\arcsin x) = \dfrac{1}{\sqrt{1-x^2}}$

7. $\dfrac{d}{dx}(\arccos x) = -\dfrac{1}{\sqrt{1-x^2}}$

8. $\dfrac{d}{dx}\left(arctgx\right) = \dfrac{1}{1+x^2}$

9. $\dfrac{d}{dx}(arc\cot x) = -\dfrac{1}{1+x^2}$

10. $\dfrac{d}{dx}\left(\log_a x\right) = \dfrac{1}{x}\log_a e$

11. $\dfrac{d}{dx}\left(a^x\right) = a^x \ln a$

12. $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx}$

13. $\dfrac{d}{dx}\left(f \cdot g\right) = \dfrac{df}{dx}g + f\dfrac{dg}{dx}$

14. $\frac{d}{dx}\left(\frac{f}{g}\right)=\frac{f'g-fg'}{g^2}$

15. $\left[R(\cos\theta+i\sin\theta)\right]^{\frac{m}{n}}=R^{\frac{m}{n}}\left[\cos\left(\theta+2\pi k\right)\frac{m}{n}+i\sin\left(\theta+2\pi k\right)\frac{m}{n}\right]$

<u>אינטגרלים</u>

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

2. $\int x^{-1}dx=\ln x+c$

3. $\int a^x dx=\frac{a^x}{\ln a}+c$

4. $\int e^x dx=e^x+c$

5. $\int \sinh x dx=\cosh x+c$

6. $\int \cosh x dx=\sinh x+c$

7. $\int \operatorname{csc}h^2 x dx=-\coth x+c$

8. $\int \sec h^2 x dx=\tanh x+c$

9. $\int \tanh x dx=\ln\cosh x+c$

10. $\int \coth x dx=\ln\sinh x+c$

11. $\int \sin x dx=-\cos x+c$

12. $\int \cos x dx=\sin x+c$

13. $\int \csc^2 x dx=-\cot x+c$

14. $\int \sec^2 x dx=\tan x+c$

15. $\int \tan x dx=-\ln\cos x+c$

16. $\int \cot x dx=\ln\sin x+c$

17. $\int \csc x dx=\ln\tan\frac{x}{2}+c$

18. $\int \sec x dx=\ln(\tan x+\sec x)+c$

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

20. $\int\frac{dx}{x^2+a^2}=\frac{1}{a}\arctan\frac{x}{a}+c$

21. $\int\frac{dx}{\sqrt{a^2-x^2}}=\arcsin\frac{x}{a}+c$

22. $\int\frac{dx}{x\sqrt{x^2-a^2}}=\frac{1}{a}arc\sec\frac{x}{a}+c$

23. $\int\frac{dx}{\sqrt{a^2+x^2}}=\ln(x+\sqrt{x^2+a^2})+c$

24. $\int\frac{dx}{\sqrt{x^2-a^2}}=\ln(x+\sqrt{x^2-a^2})+c$

<u>הצבות</u>

1. $a^2-b^2x^2\Rightarrow x=\frac{a}{b}\sin\theta$ **2.** $a^2+b^2x^2\Rightarrow x=\frac{a}{b}\tan\theta$ **3.** $b^2x^2-a^2\Rightarrow x=\frac{a}{b}\sec\theta$

<u>דיפרנציאל שלם:</u>

$dz=\frac{\partial f}{\partial x}dx+\frac{\partial f}{\partial y}dy\qquad z=f(x,y)$

<u>תנאי הכרחי לנקודות קיצוניות:</u>

$$\left(\frac{\partial^2 f}{\partial x\partial y}\right)^2-\frac{\partial^2 f}{\partial x^2}\frac{\partial^2 f}{\partial y^2}<0$$

<u>נוסחת השרשרת:</u>

$$\frac{\partial z}{\partial t}=\frac{\partial f}{\partial x}\frac{\partial x}{\partial t}+\frac{\partial f}{\partial y}\frac{\partial y}{\partial t},\quad \frac{\partial z}{\partial s}=\frac{\partial f}{\partial x}\frac{\partial x}{\partial s}+\frac{\partial f}{\partial y}\frac{\partial y}{\partial s},\quad z=f(x,y),\ x=x(s,t),\ y=y(s,t)$$