# TRIGONOMETRIC RATIO-PYQ

**1.** If $y = \sec^2\theta + \cos^2\theta$, $\theta \neq 0$, then- **[AIEEE-2002]**
(1) $y = 0$ (2) $y \leq 2$
(3) $y \geq -2$ (4) $y > 2$.

**2.** If $\alpha$ is a root of $25\cos^2\theta + 5\cos\theta - 12 = 0$, $\frac{\pi}{2} < \alpha < \pi$, then $\sin 2\alpha =$ **[AIEEE-2002]**

(1) $\frac{24}{25}$ (2) $-\frac{24}{25}$ (3) $\frac{13}{18}$ (4) $-\frac{13}{18}$

**3.** If $\sin(\alpha+\beta) = 1$, $\sin(\alpha-\beta) = \frac{1}{2}$, then $\tan(\alpha+2\beta)\tan(2\alpha+\beta) =$ **[AIEEE-2002]**
(1) 1 (2) –1
(3) zero (4) None of these

**4.** $\text{cosec}^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if - **[AIEEE-2003]**
(1) $x + y \neq 0$ (2) $x = y$, $x \neq 0$
(3) $x = y$ (4) $x \neq 0$, $y \neq 0$

**5.** If $0 < x < \pi$, and $\cos x + \sin x = \frac{1}{2}$, then $\tan x$ is- **[AIEEE-2006]**

(1) $(4-\sqrt{7})/3$ (2) $-(4+\sqrt{7})/3$

(3) $(1+\sqrt{7})/4$ (4) $(1-\sqrt{7})/4$

**6.** Let A and B denote the statements : **[AIEEE-2009]**
A : $\cos\alpha + \cos\beta + \cos\gamma = 0$
B : $\sin\alpha + \sin\beta + \sin\gamma = 0$
if $\cos(\beta-\gamma) + \cos(\gamma-\alpha) + \cos(\alpha-\beta) = -\frac{3}{2}$ then :
(1) Both A and B are true
(2) Both A and B are false
(3) A is true and B is false
(4) A is false and B is true

**7.** If $A = \sin^2 x + \cos^4 x$, then for all real x :- **[AIEEE-2011]**

(1) $1 \leq A \leq 2$ (2) $\frac{3}{4} \leq A \leq \frac{13}{16}$

(3) $\frac{3}{4} \leq A \leq 1$ (4) $\frac{13}{16} \leq A \leq 1$

**8.** In a $\Delta PQR$, if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then $\angle R =$ **[AIEEE-2012]**

(1) $\frac{3\pi}{4}$ (2) $\frac{5\pi}{6}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$

**9.** The value of $\cos 255° + \sin 195°$ is : **[AIEEE-2012 (Online)]**

(1) $-\frac{\sqrt{3}-1}{\sqrt{2}}$ (2) $\frac{\sqrt{3}-1}{\sqrt{2}}$

(3) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (4) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

**10.** Suppose $\theta$ and $\phi$ ($\neq 0$) are such that $\sec(\theta+\phi)$, $\sec\theta$ and $\sec(\theta-\phi)$ are in A.P. If $\cos\theta = k\cos\left(\frac{\phi}{2}\right)$ for some k, then k is equal to :- **[AIEEE-2012 (Online)]**

(1) $\pm\frac{1}{\sqrt{2}}$ (2) $\pm\sqrt{2}$ (3) $\pm 2$ (4) $\pm 1$

**11.** The expression $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ can be written as **[JEE (Main)-2013]**
(1) sinA cosA + 1 (2) secA cosecA + 1
(3) tanA + cotA (4) secA + cosecA

**12.** Let $f_K(x) = \frac{1}{k}\left(\sin^k x + \cos^k x\right)$ where $x \in R$ and $k \geq 1$. Then $f_4(x) - f_6(x)$ equals: **[JEE (Main)-2014]**

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{12}$

**13.** Let $\frac{3\pi}{4} < \theta < \pi$ and $\sqrt{2\cot\theta + \frac{1}{\sin^2\theta}} = k - \cot\theta$, then k is equal to :- **[JEE(Main)-2014]**
(1) 1 (2) –1
(3) 0 (4) 1/2

**14.** If $2\cos\theta + \sin\theta = 1\left(\theta \neq \frac{\pi}{2}\right)$, then $7\cos\theta + 6\sin\theta$ is equal to **[JEE(Main)-2014(Online)]**

(1) $\frac{1}{2}$ (2) $\frac{46}{5}$ (3) 2 (4) $\frac{11}{2}$

**15.** If $\text{cosec}\,\theta = \frac{p+q}{p-q}$ $(p \neq q \neq 0)$, then $\left|\cot\left(\frac{\pi}{4}+\frac{\theta}{2}\right)\right|$ is equal to : **[JEE(Main)-2014(Online)]**

(1) pq (2) $\sqrt{pq}$

(3) $\sqrt{\frac{q}{p}}$ (4) $\sqrt{\frac{p}{q}}$

**16.** If $f(\theta) = \begin{vmatrix} 1 & \cos\theta & 1 \\ -\sin\theta & 1 & -\cos\theta \\ -1 & \sin\theta & 1 \end{vmatrix}$ if A, B are respectively the maximum and the minimum values of $f(\theta)$, then (A, B) is equal to :-

**[JEE(Main)-2014(Online)]**

(1) $(4, 2-\sqrt{2})$ (2) $(2+\sqrt{2}, 2-\sqrt{2})$

(3) $(3, -1)$ (4) $(2+\sqrt{2}, -1)$

**17.** If $\cos\alpha + \cos\beta = \frac{3}{2}$ and $\sin\alpha + \sin\beta = \frac{1}{2}$ and $\theta$ is A.M. of $\alpha$ and $\beta$, then $\sin 2\theta + \cos 2\theta$ is equal to

**[JEE (Main)-2015(Online)]**

(1) $\frac{3}{5}$ (2) $\frac{7}{5}$ (3) $\frac{4}{5}$ (4) $\frac{8}{5}$

**18.** If m and M are the minimum and the maximum values of

$4+\frac{1}{2}\sin^2 2x - 2\cos^4 x,\ x \in R$, then M – m is equal to

**[JEE(Main)-2016(Online)]**

(1) $\frac{9}{4}$ (2) $\frac{15}{4}$ (3) $\frac{1}{4}$ (4) $\frac{7}{4}$

**19.** If A > 0, B > 0 and $A + B = \frac{\pi}{6}$, then the minimum value of tanA + tanB is :-

**[JEE(Main)-2016(Online)]**

(1) $2-\sqrt{3}$ (2) $4-2\sqrt{3}$

(3) $\sqrt{3}-\sqrt{2}$ (4) $\frac{2}{\sqrt{3}}$

**20.** If tan A and tanB are the roots of the quadratic equation, $3x^2-10x-25=0$, then the value of $3\sin^2(A+B)-10\sin(A+B).\cos(A+B)-25\cos^2(A+B)$ is:

**[JEE(Main)-2018(Online)]**

(1) 10 (2) –10 (3) 25 (4) –25

**21.** If an angle A of a $\Delta ABC$ satisfies $5\cos A + 3 = 0$, then the roots of the quadratic equation, $9x^2+27x+20=0$ are : **[JEE(Main)-2018(Online)]**

(1) sinA, secA (2) secA, cotA

(3) secA, tanA (4) tanA, cosA

**22.** If $K = \sin(\pi/18)\sin(5\pi/18)\sin(7\pi/18)$, then the numerical value of K is- **[IIT-93]**

(1) 1/8 (2) 1/16

(3) 1/2 (4) None of these

**23.** In a triangle PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the equation $ax^2 + bx + c = 0$ $(a \neq 0)$, then- **[IIT-99]**

(1) a + b = c (2) b + c = a

(3) a + c = b (4) b = c

**24.** Let $f(\theta) = \sin\theta(\sin\theta + \sin 3\theta)$. Then $f(\theta)$ **[IIT-2000]**

(1) $\geq 0$ only when $\theta \geq 0$ (2) $\leq 0$ for all real $\theta$

(3) $\geq 0$ for all real $\theta$ (4) $\leq 0$ only when $\theta \leq 0$

**25.** If $\alpha + \beta = \frac{\pi}{2}$ and $\beta + \gamma = \alpha$, then $\tan\alpha$ equals- **[IIT-2001]**

(1) $2(\tan\beta + \tan\gamma)$ (2) $\tan\beta + \tan\gamma$

(3) $\tan\beta + 2\tan\gamma$ (4) $2\tan\beta + \tan\gamma$

**26.** Let $Z = \cos\theta + i\sin\theta$ then the value of $\sum_{m=1}^{15} \text{Im}(Z^{2m-1})$ at $\theta = 2°$ : **[IIT-2009]**

(1) $\frac{1}{\sin 2°}$ (2) $\frac{1}{3\sin 2°}$ (3) $\frac{1}{2\sin 2°}$ (4) $\frac{1}{4\sin 2°}$

**27.** The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is **[IIT-2010]**

(1) 2 (2) $\frac{1}{2}$

(3) 1 (4) None of these

| PREVIOUS YEARS QUESTIONS | | | | ANSWER KEY | | | | | | Exercise-II |
|---|---|---|---|---|---|---|---|---|---|---|
| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Ans. | **4** | **2** | **1** | **2** | **2** | **1** | **3** | **3** | **1** | **2** |
| Que. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Ans. | **2** | **4** | **2** | **3** | **3** | **2** | **2** | **1** | **2** | **4** |
| Que. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | | | |
| Ans. | **3** | **1** | **1** | **3** | **3** | **4** | **1** | | | |