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$-\frac{1}{2}\sin 2\alpha \frac{\cos\alpha}{\sin\alpha} = \frac{c^2 - s^2}{s\ c}$

$= -\frac{1}{4}\sin 2\alpha\left(\cot\frac{\alpha}{2} - \tan\frac{\alpha}{2}\right)$

$\frac{\pi}{2} + \frac{A-B}{2}$

$\sin\left(A + \frac{\pi - A - B}{2}\right) = k \sin\left(\frac{\pi}{2} - \frac{A+B}{2}\right)$

$\frac{(\cos\alpha + \sin\alpha)}{(\cos^2\alpha - \sin^2\alpha)} \frac{(1-\tan\alpha)}{(\tan\alpha + 1)}$

$\frac{1+\tan\alpha}{1-\tan\alpha}$

$\frac{\cos\left(\frac{A-B}{2}\right)}{\cos\left(\frac{A+B}{2}\right)} = \frac{k}{1}$

$\tan\frac{A}{2}\tan\frac{B}{2} = \frac{k-1}{k+1}$

$\boxed{(-2,4) - \{2\}}$

$1 - \cos^2\alpha$

15.

$\boxed{x = \frac{\pi}{36}}$

$\boxed{y = \frac{3}{a+2} > 0}$

19.

① $x + ay = 3$

② $ax + 4y = 6$

② $\times a$ − ① $\times 4$

$(a^2 - 4)x = 6a - 12$

$(a-2)(a+2)x = 6(a-2)$

$\boxed{x = \frac{6}{a+2} > 0, \quad a \neq 2}$

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16.

$$\frac{\overset{\tan 45^\circ}{1} + \tan 96^\circ}{1 - \tan 96^\circ \tan 45^\circ} = \tan(141^\circ) = \tan\theta$$

$$\tan\theta - \tan 141 = 0 = \frac{\sin(\theta - 141)}{\cos\theta \cos 141}$$

$$\theta - 141 = \quad = 180k$$

$$107n - 141 = 180k$$

$$\boxed{3} = n = \frac{141 + 180k}{107} \qquad n \in N, k \in I.$$

$$\boxed{k = 1}$$

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$$\frac{\sin^2\theta-\cos^2\theta}{\sin\theta\cos\theta}=a=\frac{-b(\sin\theta+\cos\theta)}{\sin\theta\cos\theta}$$

$$\left((\tan\theta-\cot\theta)^2+4\right)\left((\cos\theta-\sin\theta)^2-1\right)^2=\boxed{(\tan\theta+\cot\theta)^2\sin^2 2\theta}$$

$$\left(\frac{1}{\sin\theta\cos\theta}\right)^2\sin^2 2\theta$$

$$\frac{a}{2}\left(1-b^2\right)=\frac{a}{2}\left(\underbrace{(\sin\theta+\cos\theta)^2}_{2-(\sin\theta-\cos\theta)^2}-1\right)=-b(\sin\theta+\cos\theta)$$

$$(\sin\theta+\cos\theta)^2+(\sin\theta-\cos\theta)^2=2$$

$$\frac{a^2}{4}(b^2-1)^2=b^2(2-b^2)$$

$$=\boxed{4}$$

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$$\underbrace{|x^2-x-6|}_{\geq 0} = \underset{\sim\sim}{x+2}.$$

$$\boxed{x=4,2,-2}$$

$4 \quad -4$

$$(x^2-x-6)^2-(x+2)^2=0$$

$$(x^2-2x-8)(x^2-4)=0$$

$$(x-4)(x+2)(x-2)(x+2)=0$$

$$x=4,2,-2$$

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28. $\left|\underbrace{\left(2\cos^2\frac{\pi}{7}-1\right)}\cos\frac{\pi}{7}-\cos^2\frac{\pi}{7}\right|$

$\boxed{\cos\frac{2\pi}{7}\cos\frac{\pi}{7}}-\cos^2\frac{\pi}{7}$

$\pi-\frac{3\pi}{7}$

$\frac{\sin\frac{4\pi}{7}}{4\sin\frac{\pi}{7}}-\cos^2\frac{\pi}{7}=\frac{\sin\frac{3\pi}{7}}{4\sin\frac{\pi}{7}}-\cos^2\frac{\pi}{7}$

$\frac{3}{4}-\sin^2\frac{\pi}{7}-\cos^2\frac{\pi}{7}$

$=-\frac{1}{4}$

Nishant Jindal

3: $2\ln\left(\frac{a+b}{3}\right) = \ln a + \ln b$

$\ln\left(\frac{a+b}{3}\right)^2 = \ln ab$

$a^2+b^2+2ab = 9ab$

$\boxed{\frac{a}{b}+\frac{b}{a} = 7}$

$83^1 = 10^{\log_x 83} = 83^{\log_x 10}$

$1 = \log_x 10$

$\boxed{x = 10}$

4: $\log_{11}\left(\log_7\left(\sqrt{x+5}+\sqrt{x}\right)\right) = \log_{11} 1$

$\log_7\left(\sqrt{x+5}+\sqrt{x}\right) = 1$

$\sqrt{x+5}+\sqrt{x} = 7$

$\cancel{x}+5 = 49+\cancel{x}-14\sqrt{x}$

$\boxed{7\sqrt{x} = 22}$

$x = \left(\frac{22}{7}\right)^2$

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$$\frac{\overset{>0}{\log_{10} d}}{\log_{10} 2} \qquad \frac{\overset{>0}{\log_{10} d}}{\log_{10} 3}$$

$$\log_{10} 2 < \log_{10} e < \log_{10} 3 < \log_{10} 8$$

$$\frac{1}{\log_{10} 2} > \frac{1}{\log_{10} e} > \frac{1}{\log_{10} 3} > \frac{1}{\log_{10} 8}$$

$$2 < e < 3$$

$$\frac{\log_{10} d}{\log_{10} 2} > \frac{\log_{10} d}{\log_{10} e} > \frac{1}{2} > \frac{1}{3}$$

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9.

$$xyz = \frac{\log_{10} a}{\cancel{\log_{10} 2a}} \cdot \frac{\cancel{\log_{10} 2a}}{\cancel{\log_{10} 3a}} \cdot \frac{\cancel{\log_{10} 3a}}{\log_{10} 4a}$$

$$= \frac{\log_{10} a}{\log_{10} 4a} = \log_{4a} a$$

$$xyz + 1 = \log_{4a} a + \log_{4a} 4a$$

$$= \log_{4a}(4a^2) = \boxed{2\log_{4a} 2a} =$$

$$yz = \frac{\log 2a}{\cancel{\log 3a}} \cdot \frac{\cancel{\log 3a}}{\log 4a} = \log_{4a} 2a.$$

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$$\boxed{x^{1/x} = (100)^{\frac{1}{100}}} \quad 4.$$

$x > 0, x \neq 0$

$$\log_2(xy) \geq \log_2 2^6$$

$$\boxed{xy \geq 64} \qquad y \geq \frac{64}{x}$$

$$\boxed{100^x = x^{100}}$$

$$x + y \geq x + \frac{64}{x} = \left(\sqrt{x} - \frac{8}{\sqrt{x}}\right)^2 + 16 \geq 16.$$

$a = b$

$$\boxed{a^m = b^m} \qquad \boxed{\frac{1}{100x}}$$

$\underline{5.}$

$$x = \boxed{50} \log_{10} x$$

$$x = \log_{10^2}(x^{50})^2 \Leftarrow x = \log_{10} x^{50}$$

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7: $N = \left(\frac{2}{10}\right)^{25}$

$\log_{10} N = 25\left(0.30103 - 1\right)$

$= -25 \times 0.69897$

$= -17.47425$

$= -18 + 0.525575$

$N = 10^{0.525575} \times 10^{-18}$

$\boxed{17}$

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$$\boxed{(-\infty,-1]\cup[1,\infty)}$$

9:

$$\log_2|5x-4| > \log_2 4$$

$$|5x-4| > 4$$

$$(5x-4)^2 > 16$$

$$(5x-8)5x > 0$$

+   −   +

0   $\frac{8}{5}$

$$\boxed{x \in (-\infty,0)\cup\left(\frac{8}{5},\infty\right)}$$

2:

$$\sqrt{\log_{10} x^2}$$

$$\log_{10} x^2 \ge 0 = \log_{10} 1$$

$$x^2 \ge 1$$

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$$\log_{0.1}(0.1)^{\frac{1}{2}} \le \log_{0.1} x \le \log_{0.1}(0.1)^{2} \qquad \boxed{\frac{3}{2}}$$

$$(0.1)^{2} \le x \le (0.1)^{1/2}$$

$$\frac{1}{4} = \frac{\overset{8.}{\frac{1}{2}\left(\log_{a}b\right)\frac{1}{2}\log_{b}a}\;\left(\cancel{a^{\log_e b}}\right)\left(\log_{a^2} b\right)\left(\log_{b^2} a\right)}{\cancel{\left(e^{\log_e a}\right)^{\log_e b}}} = \frac{}{a^{\log_e b}}$$

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$\boxed{x \in \left(-\frac{3}{2}, -1\right) \cup (-1, 0) \cup (0, 3)}$

1. $\log_{(2x+3)} (x^2) < 1$

$\boxed{x \in (-1, 0) \cup (0, 3)}$

$\log_{(2x+3)} x^2 < \log_{2x+3} (2x+3)$

$\boxed{-\frac{3}{2} < x < -1}$

$0 < 2x+3 < 1$
&
$x^2 > 2x+3$

$(x-3)(x+1) > 0$

$\boxed{x \in (-\infty, -1) \cup (3, \infty)}$

OR

$2x+3 > 1 \Rightarrow \boxed{x > -1}$
&
$0 < x^2 < 2x+3 \Rightarrow$

$\boxed{x \in (-1, 3) - \{0\}}$

$\boxed{x \in \left(-\frac{3}{2}, -1\right)}$

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Q: $\log_{(x+3)}(x^2-x) < 1$ ✓

$$\boxed{\{x - I\ (1-10)\}}$$