

# Math 418

Dec. 17

Final Exam

$$1. \sin(x) + 1 = 0, \sin(x) = -1, \boxed{x \neq \frac{\pi}{3}}$$

$$2a. q^{2x} + 4(q^x) - 45 = 0, w^2 + 4w - 45 = 0, (w-5)(w+9) = 0$$

$$w = q^x, q^x = 5 \Rightarrow \boxed{x = \log_q(5)}, q^x = -9, \cancel{x = \log_q(-9)}$$

$$b. \ln(-x) + \ln(2-x) = \ln(6), \ln((2-x)(-x)) = \ln(6)$$

$$\ln(-2x+x^2) = \ln(6), \ln(x(x-2)) = \ln(6), x(x-2) = 6$$

$$x^2 - 2x - 6 = 0, a=1, b=-2, c=-6 \quad 6 \pm \sqrt{36+48} \quad 4(1)(-2)$$

$$\frac{6 \pm \sqrt{44}}{2} = x \quad \sqrt{44} \approx 6.5 \quad \boxed{x = \frac{6 \pm \sqrt{44}}{2}}$$

$$-2x^2 + 8x + 10 \rightarrow -2(x^2 - 4x - 5)$$

$$3. (x-4)(x-4) = x^2 - 8x + 16 \quad \begin{array}{l} \boxed{-2x^4 + 24x^3 - 86x^2 + 48x + 160} \\ - \quad -2x^4 + 16x^3 - 32x^2 \downarrow \\ \quad \quad \quad 8x^3 - 54x^2 + 48x \downarrow \\ \quad \quad \quad - 8x^3 - 64x^2 + 128x \downarrow \\ \quad \quad \quad 10x^2 - 80x + 160 \\ \quad \quad \quad - 10x^2 - 80x + 160 \end{array} \quad (x-4)(x+1)$$

$$\boxed{f(x) = (x-4)^2(x-5)(x+1)}$$

$$4. y = \log_7(9) - 3 \times \log_7(5) \quad \boxed{m = -3 \log_7(5)}$$

$$5a. \sin\left(\frac{\pi}{12}\right), \frac{\pi}{12} = \frac{13\pi}{12} - \frac{10\pi}{12} + \frac{3\pi}{12} = \frac{5\pi}{6} + \frac{\pi}{4}$$

$$\sin\left(\frac{5\pi}{6} + \frac{\pi}{4}\right) = \sin\left(\frac{5\pi}{6}\right)\cos\left(\frac{\pi}{4}\right) + \cos\left(\frac{5\pi}{6}\right)\sin\left(\frac{\pi}{4}\right), \frac{1}{2} \cdot \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{2}.$$

$$= \frac{\sqrt{3}\sqrt{2}}{4}, \boxed{\sin\left(\frac{\pi}{12}\right) = \frac{\sqrt{2}\sqrt{3}-\sqrt{2}}{4}}$$

$$b. \cos\left(\frac{3\pi}{4} - \frac{\pi}{6}\right) = \cos\left(\frac{3\pi}{4}\right)\cos\left(\frac{\pi}{6}\right) + \sin\left(\frac{3\pi}{4}\right)\sin\left(\frac{\pi}{6}\right)$$

$$-\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} = \frac{-\sqrt{2}\sqrt{3}}{4}, \quad \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{2}}{4}, \quad \boxed{\cos\left(\frac{3\pi}{4} - \frac{\pi}{6}\right) = \frac{\sqrt{2}-\sqrt{2}\sqrt{3}}{4}}$$

$$6. f(x) = \frac{2x+1}{3x-10} \quad 3x = -10, x = -10/3 \quad \cancel{3x(y+10)} = 2y - 1,$$

$$3xy + 10x - 2y - 1 = 0, 3xy - 2y = 1 - 10x, y(3x-2) = 1 - 10x,$$

$$y = \frac{1-10x}{3x-2} \quad 3x = 2, x = 2/3$$

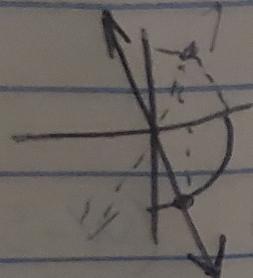
$\text{Dom } f(x) = \{x | x \neq -10/3\}$   
 $\text{Range } f(x) = \{y | y \neq 1/3\}$   
 $f^{-1}(x) = \frac{1-10x}{3x-2}$

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Fa.



$$\tan \theta = -4$$

$$\frac{\sin \theta}{\cos \theta} = -4 \quad \sin \theta = -4 \cos \theta$$

$$\tan(\theta) \text{ is } \cancel{\text{opp}} \cancel{\text{adj}} \quad \tan\left(\frac{7\pi}{4}\right) = 1$$

$$\tan\left(\frac{7\pi}{4} + \frac{28\pi}{4}\right) = \frac{-28\pi}{4} =$$

$$1^2 = (4x)^2 + x^2, \quad 5x^2 = 1, \quad x = \sqrt{\frac{1}{5}}$$

$$\boxed{\cos \theta = \sqrt{\frac{1}{5}}}$$

$$\sin^2 \theta = 4/5$$

$$\sin \theta = \frac{2}{\sqrt{5}}, \quad \frac{2\sqrt{5}}{5}, \quad \sqrt{\frac{4}{5}}$$

$$\boxed{b. \quad \sin(-\theta) = -\sqrt{\frac{4}{5}}}$$