Find a formula for $f^{-1}(x)$. **Give the domain of** $f^{-1}(x)$, **including any restrictions "inherited" from f.**

1. $f(x) = \dfrac{5x}{x-8}$

$D: (-\infty, 8) \cup (8, \infty)$

$-8x = y(5-x)$

$x = \dfrac{5y}{y-8}$

$x(y-8) = 5y$

$\cancel{y} f^{-1}(x) = \dfrac{-8y}{5-x}$

$xy - 8x = 5y$

$-8x = 5y - xy$

$D: (-\infty, 5) \cup (5, 8) \cup (8, \infty)$

Expand each logarithm. Rewrite each expression as a sum, difference, or product of logs.

2. $\log \dfrac{2xy}{z}$

$\log 2 + \log x + \log y - \log z$

3. $\log (3xyz^2)^3$

$3\log(3xyz^2)$

$3[\log 3 + \log x + \log y + 2\log z)$

$3\log 3 + 3\log x + 3\log y + 6\log z$

4. $\ln \dfrac{3y}{\sqrt[4]{x}}$

$\ln 3y - \ln x^{\frac{1}{4}}$

$\ln 3 + \ln y - \frac{1}{4}\ln x$

For the following exercises, condense each expression to a single logarithm using the properties of logarithms.

5. $\ln x - \ln y + \ln z + \ln 3$

$\ln \dfrac{3xz}{y}$

6. $3[\ln(x-2) + 2\ln(x+1) - 5\ln(x-1)]$

$3[\ln(x-2) + \ln(x+1)^2 - \ln(x-1)^5]$

$\ln(x-2)^3 + \ln(x+1)^6 - \ln(x-1)^{15}$

$\ln \dfrac{(x-2)^3(x+1)^6}{(x-1)^{15}}$

Find the exact solution to the equation.

7. $\log_{10}(x - 3) = -1$

$10^{-1} = x - 3$

$\dfrac{1}{10} = x - 3$

$x = 3\dfrac{1}{10} = \dfrac{31}{10} = 3.1$

8. $9\ln(x - 5) = 1$

$\ln(x-5) = \dfrac{1}{9}$

$e^{\frac{1}{9}} = x - 5$

$x = e^{1/9} + 5$

9. $9^{7x} = 81$

$9^{7x} = 9^2$

$7x = 2$

$x = \dfrac{2}{7}$

10. $100\left(\dfrac{1}{5}\right)^{\frac{x}{2}} = 4$

$\left(\dfrac{1}{5}\right)^{\frac{x}{2}} = \dfrac{1}{25}$

$\left(\dfrac{1}{5}\right)^{\frac{x}{2}} = \left(\dfrac{1}{5}\right)^2$

$\dfrac{x}{2} = 2$

$x = 4$

Solve the equation.

11. $\log 2x = \log 5 + \log(x - 2)$

$\log 2x = \log 5(x-2)$

$2x = 5x - 10$

$-3x = -10$

$x = \dfrac{10}{3}$

12. $\log(4 + x) - \log(x - 3) = \log 4$

$\log \dfrac{4+x}{x-3} = 4$

$(x-3)\left(\dfrac{4+x}{x-3}\right) = (4)(x-3)$

$4 + x = 4(x-3)$

$4 + x = 4x - 12$

$4 = 3x - 12$

$16 = 3x$

$x = \dfrac{16}{3}$

Find an approximate solution to the equation. Round to 3 Decimal places.

13. $2^x = 17$

$\ln 2^x = \ln 17$

$x \ln 2 = \ln 17$

$x = \dfrac{\ln 17}{\ln 2}$

$= 4.087$

14. $e^{-0.15t} = 0.22$

$\ln e^{-.15t} = \ln .22$

$-.15t = \ln .22$

$t = \dfrac{\ln .22}{-.15}$

$= 10.094$

15. $6 \ln(x + 2.8) = 9.6$

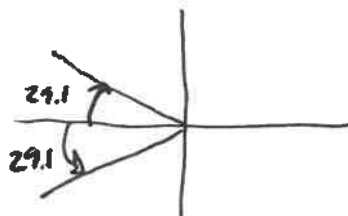$\ln(x + 2.8) = 1.6$

$e^{1.6} = x + 2.8$

$e^{1.6} - 2.8 = x$

$x = 2.153$

Use your calculator to solve the equation between $0 \le \theta < 360$. **Round your answers to the nearest tenth. You should have 2 answers.**

$\cos^{-1}(-.874) \longrightarrow$

16. $\cos \theta = -0.874 = \underline{150.9}$

29.1

29.1

$180 + 29.1 = \underline{209.1}$

17. $\sin \theta = 0.621$

$\sin^{-1}(.621) = 38.4°$

$180 - 38.4 = 141.6°$

Math 3

Name _____

Inverse Test Non – Calculator Review

Date _____ Per _____

Evaluate the logarithm

1. $\log_4 256$

$4^y = 256$

4

2. $\log_6 \left(\frac{1}{36}\right)$

$6^y = \frac{1}{36}$

$= -2$

3. $\log_7 7^8$

8

Find the **exact value** of the function.

$\frac{17\pi}{6} - \frac{12\pi}{6}$

4. $\cos \frac{17\pi}{6} = \cos \frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$

5. $\tan 690° = \tan 330° = \frac{-\frac{1}{2} \cdot \sqrt{3}}{\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}}$

$\begin{array}{r} 690 \\ -360 \\ \hline 330 \end{array}$

$\begin{array}{r} 630 \\ -360 \\ \hline 270 \end{array}$

6. $\sin 630° = \sin 270° = -1$

7. $\sin (-150)° = \sin 210 = -\frac{1}{2}$

8. $\cos \frac{-5\pi}{4} = \cos \frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$

9. $\tan -\frac{3\pi}{2} = \tan \frac{\pi}{2} = undefined$

Find the exact value of the expression in **radians and degrees**.

10. $\sin^{-1}\left(\frac{1}{2}\right) = 30° \quad \frac{\pi}{6}$

11. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) = 150°, \frac{5\pi}{6}$

12. $\tan^{-1}\left(-\sqrt{3}\right)$

$-60°, -\frac{\pi}{3}$

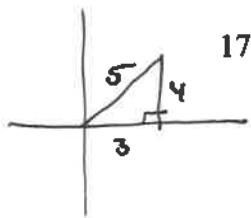13. $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

$-60°, -\frac{\pi}{3}$

Find the exact value given the following information. Give your answer in radians or degrees.

14. $\cos^{-1}\left(\tan\frac{\pi}{4}\right)$

$\cos^{-1}(1)$

$0°$

15. $\sin\left(\cos^{-1}-\frac{1}{2}\right)$
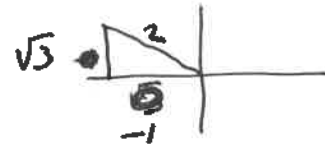
$\sin(120°)$

$\frac{\sqrt{3}}{2}$

16. $\sin^{-1}\left(\cos\frac{2\pi}{3}\right)$

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

$-30°, \ -\frac{\pi}{6}$

Use Pythagorean Theorem to find the exact value.

17. $\sin\left(\tan^{-1}\frac{4}{3}\right)$

$\sin\theta = \frac{4}{5}$

18. $\sin\left(\cos^{-1}\left(-\frac{1}{2}\right)\right)$

$\sin\theta = \frac{\sqrt{3}}{2}$

Solve each equation between $0 \le \theta < 360$

19. $4\sin\theta + 2 = 2$

$4\sin\theta = 0$

$\sin\theta = 0$

$0°, \ 180°$

$0, \ \pi$

20. $\sin 3\theta = -\frac{1}{2}$

$3\theta = 210 \pm 360k$ $3\theta = 330 \pm 360k$

$\theta = 70 \pm 120k$ $\theta = 110 \pm 120k$

$70, 190, 310$ $110, 230, 350$

21. $sin^2\theta - 2\sin\theta + 1 = 0$

$(\sin\theta - 1)(\sin\theta - 1) = 0$

$\sin\theta = 1 \quad \sin\theta = 1$

$90°, \ \frac{\pi}{2}$

22. $\tan^2\theta + \tan\theta = 0$

$\tan\theta(\tan\theta - 1) = 0$

$\tan\theta = 0 \quad \tan\theta - 1 = 0$

$\quad\quad\quad\quad \tan\theta = 1$

$0, 180° \quad\quad 45°, 225°$

23. $-3\tan\theta + 1 = 4$

$-3\tan\theta = 3$

$\tan\theta = -1$

$135°, \ 315°$

24. $4sin^2\theta - 1 = 2$

$4\sin^2\theta = 3$

$\sin^2\theta = \frac{3}{4}$

$\sin\theta = \pm\frac{\sqrt{3}}{2}$