19. Solve each of the following:

$x-2=\sqrt{2-x}$

$(x-2)^2 = 2-x$

$x^2-4x+4 = 2-x$

$x^2-3x+2=0$

$(x-2)(x-1)=0$

$x=2,1$

CHECK

2 WORKS

1 DOES NOT

$\boxed{x=2}$

$2\sqrt{x-11}-8=4$

$2\sqrt{x-11} = 12$

$\sqrt{x-11} = 6$

$x-11 = 36$

$x = 47$

CHECK

$2\sqrt{47-11}-8=4$

$2\sqrt{36}-8=4$

$12-8=4$ ✓

$\boxed{x=47}$

20. Write $\ln(x-5)=3$ as an exponential equation. Write $y=3(4)^t$ as a logarithmic equation.

$\boxed{e^3 = x-5}$

$\frac{y}{3} = 4^t$

$\boxed{\log_4\left(\frac{y}{3}\right) = t}$

21. Find the value of an investment of \$3000 at 4% after 10 years if it is compounded

a) continuously

$A = Pe^{rt}$

$A = 3000e^{.04(10)}$

$\boxed{\$4475.47}$

b. monthly

$A = P\left(1+\frac{r}{n}\right)^{nt}$

$3000\left(1+\frac{.04}{12}\right)^{12\cdot 10}$

$\boxed{\$4472.50}$

22. Evaluate:

a) $\ln e^{\frac{1}{2}}$

$= \frac{1}{2}\ln e$

$= \boxed{\frac{1}{2}}$

b) $2^{\log_2 7}$

$= \boxed{7}$

c) $\log_3\left(\frac{81}{\sqrt{3}}\right) = \log_3 81 - \log_3\sqrt{3}$

$= 4 - \log_3 3^{1/2}$

$= 4 - \frac{1}{2}\log_3 3 = 4-\frac{1}{2}$

$= \boxed{3.5}$

23. Solve:

$3^{2x+1} = 5$

$\log 3^{2x+1} = \log 5$

$(2x+1)\log 3 = \log 5$

$2x+1 = \frac{\log 5}{\log 3}$

$2x+1 = 1.4649$

$\boxed{x = .2325}$

$7\log_5(4x+1) = 21$

$\log_5(4x+1) = 3$

$5^3 = 4x+1$

$125 = 4x+1$

$124 = 4x$

$\boxed{x = 31}$

24. Write $\log_5 x$ using change of base formula. Evaluate $\log_{12} 100$ using change of base.

$\log_5 x = \boxed{\frac{\log x}{\log 5}}$

$\log_{12} 100 = \frac{\log 100}{\log 12} = \boxed{1.85}$

25. Simplify $\log_a \sqrt[3]{a}$

$= \log_a a^{1/3}$

$= \frac{1}{3}\log_a a = \boxed{\frac{1}{3}}$

$e^{\ln\sqrt{e}}$

$e^{\ln e^{1/2}} = \boxed{\frac{1}{2}}$

26. Solve

$\ln(x+3) - \ln(x) = \ln(x-1)$

$\ln\left(\frac{x+3}{x}\right) = \ln x - 1$

$\frac{x+3}{x} = x - 1$

$x + 3 = x^2 - x$

$0 = x^2 - 2x - 3$

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

$x = 3, -1$

CHECK:

only $x = 3$

$\log_3(12x+15) = 2 + \log_3(2x-1)$

$\log_3(12x+15) - \log_3(2x-1) = 2$

$\log_3\left(\frac{12x+15}{2x-1}\right) = 2$

$3^2 = \frac{12x+15}{2x-1}$

$9(2x-1) = 12x+15$

$18x - 9 = 12x + 15$

$6x = 24$

$x = 4$

CHECK

$x = 4$

27. Solve $\log_x 16 = 2$

$x^2 = 16$

$x = 4$

$e^{2x-1} = 7$

$\ln e^{2x-1} = \ln 7$

$2x - 1 = \ln 7$

$2x = \ln 7 + 1$

$x = \frac{\ln 7 + 1}{2}$

$= 1.47$

28. Expand $\ln\frac{4x^3}{y^2}$

$\ln 4 + \ln x^3 - \ln y^2$

$\ln 4 + 3\ln x - 2\ln y$

$\log_2\left(4x^3\right)^2 = \log_2 16x^6$

$= \log_2 16 + \log_2 x^6$

$4 + 6\log_2 x$

29. Condense $\frac{1}{2}\log 25 + 2\log x$

$\log 25^{1/2} + \log x^2$

$\log 5 + \log x^2$

$\log(5x^2)$

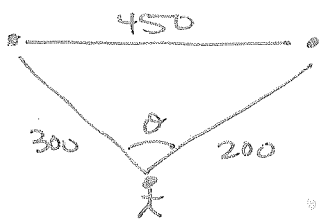
$4(\ln x - \ln y) + \frac{1}{3}\ln z$

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

$\ln x^4 - \ln y^4 + \ln z^{1/3}$

$\ln\left(\frac{x^4 z^{1/3}}{y^4}\right)$

30. Two buildings stand 450 feet apart. A person is 300 feet from one building and 200 feet from the other standing on the corner of two sidewalks. Find the angle between the two sidewalks.



Law of cosines

$450^2 = 200^2 + 200^2 - 2(300)(200)\cos\theta$

$72500 = -2(300)(200)\cos\theta$

$-.60416 = \cos\theta$

$\theta = 127.17°$

31. Convert 150° to radians.

$\frac{150°}{1} \cdot \frac{2\pi \text{ rad.}}{360°}$

$\frac{5\pi}{6}$

Convert $\frac{-7\pi}{4}$ radians to degrees.

$\frac{-7\pi}{4} \cdot \frac{360°}{2\pi}$

$= -315°$

32. Find a positive and a negative angle coterminal with $\frac{2\pi}{3}$. Write an expression for all angles coterminal to 139°.

$139^\circ + 360N$

$\frac{2\pi}{3} + 2\pi = \frac{8\pi}{3}$

$\frac{2\pi}{3} - 2\pi = -\frac{4\pi}{3}$

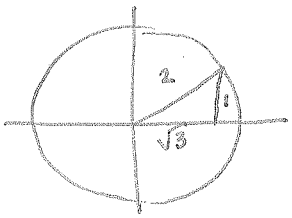
33. If $\csc\theta = 2$ and $0 < \theta < \frac{\pi}{2}$, find the exact value of the other 5 ratios.

$\csc\theta = 2$

$\frac{1}{\sin\theta} = 2$

$\sin\theta = \frac{1}{2}$

1st Quad



$\sin\theta = \frac{1}{2}$

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

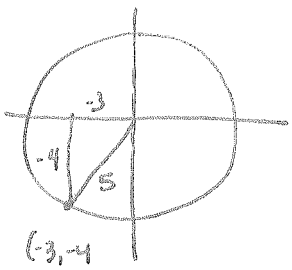
$\tan\theta = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\csc\theta = 2$

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

$\cot\theta = \sqrt{3}$

34. Let $(-3,-4)$ be a point on the terminal side of an angle θ in standard position. Find the exact value of the 6 trig ratios.



$\sin\theta = -4/5$

$\cos\theta = -3/5$

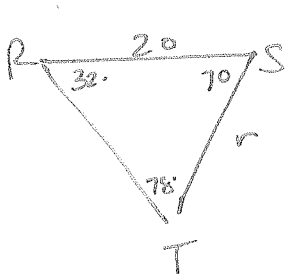
$\tan\theta = 4/3$

$\csc\theta = -5/4$

$\sec\theta = -5/3$

$\cot\theta = 3/4$

35. In ΔRST, R=32°, S=70°, and t = 20 feet. Find r.



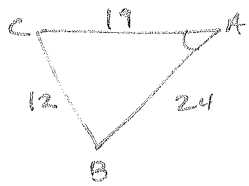
$\frac{\sin 78^\circ}{20} = \frac{\sin 32^\circ}{r}$

$r\sin 78 = 20\sin 32$

$r = \frac{20\sin 32}{\sin 78}$

$r = 10.84$ FT

If a = 12, b = 19, and c = 24, find the smallest angle.



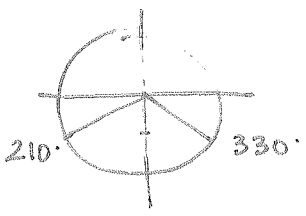
$12^2 = 19^2 + 24^2 - 2(19)(24)\cos A$

$-793 = -912\cos A$

$\frac{793}{912} = \cos A$

$A = 29.6^\circ$

36. Evaluate $\sin^{-1}\left(-\frac{1}{2}\right)$. Give the answer in both radians and degrees.



210° AND 330°

OR

$\frac{7\pi}{6}$ AND $\frac{11\pi}{6}$

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

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

$\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = 30°$

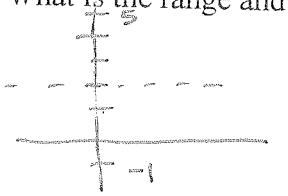
$= \pi/6$ RADIANS

38. Write the equation of a cosine function with a period π and amplitude of 3 and a maximum of 13.

$y = 3\cos(2x) + 10$

$y = 3\cos(2x) + 10$ — MIDLINE AT $y = 10$

39. What is the range and period of $y = 3\cos\left(\frac{x}{4}\right) + 2$?



amp 3 ↑ hor. stretch of 4 ↑ up 2

RANGE $-1 \le y \le 5$

PERIOD = 8π or $1440°$

40. What is the domain of $y = 3\sin x$?

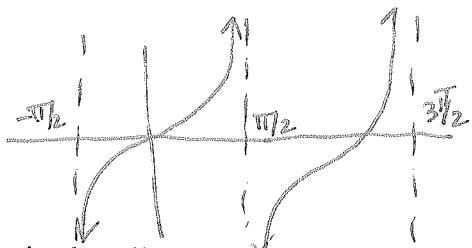
D: $\mathbb{R}$

41. State the domain, range and period of $y = \tan x$. ⟶ GRAPH

D: $x \neq \pi/2 + \pi k$

R: $\mathbb{R}$

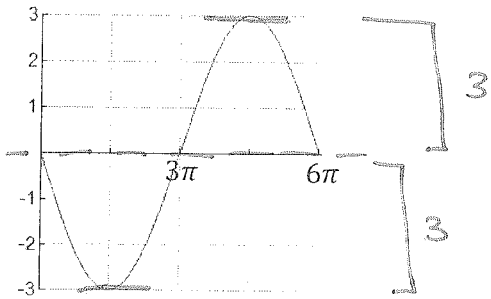
PERIOD = π



42. Describe how $f(x) = \cos x$ and $g(x) = \cos(x + \pi) + 2$ are related. That is, describe the transformations of f(x) to get g(x).

LEFT π ↑ UP 2

43. Determine the period and amplitude of the graph at the right. Give the sine equation for the graph.

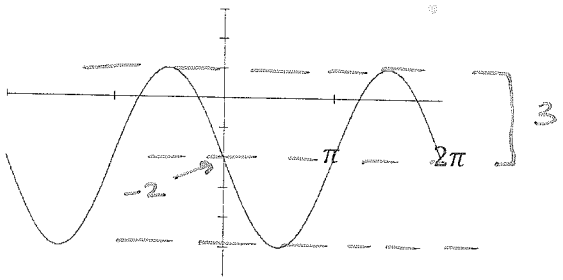


AMP: 3

PERIOD: 6π

$y = -3\sin\left(\frac{x}{3}\right)$

44. Write the equation of the graph.



$y = -3\sin(x) - 2$

OR

$y = 3\cos(x + \pi/2) - 2$

} OTHERS ARE POSSIBLE