Function Analysis/Trigonometry
2nd Semester Review

Name: Key Per. ____

Logarithms

Solve for X

1) $\log_3(x+7)+\log_3(x) = \log_3(-12)$

$\log_3(x^2+7x) = \log_3(-12)$

$x^2+7x = -12$

$x^2+7x+12 = 0$

$(x+3)(x+4) = 0$

$x = -3, -4$

NO Solution (cannot take the log of a negative number)

2) $2\log(x) - \log(5) = \log(x+10)$

$\log(x^2) - \log(5) = \log(x+10)$

$\log\left(\frac{x^2}{5}\right) = \log(x+10)$

$\frac{x^2}{5} = x+10$

$x^2 = 5x+50$

$x^2-5x-50 = 0$

$(x-10)(x+5) = 0$

$x = -5, 10$

3) $\log_6(x) = -2$

$6^{-2} = x$

$x = \frac{1}{36}$

4) $\ln(x) = 3$

$e^3 = x$

5) $\log_8(x+3) + \log_8(x-4) = 1$

$\log_8(x^2-x-12) = 1$

$x^2-x-12 = 8^1$

$x^2-x-20 = 0$

$(x-5)(x+4) = 0$ $x = -4, 5$

6) $\log_4(x-6) + \log_4(x+6) = 3$

$\log_4(x^2-36) = 3$

$x^2-36 = 4^3$

$x^2-36 = 64$

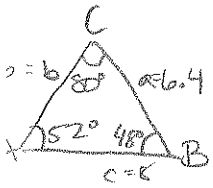
$\sqrt{x^2} = \sqrt{100}$

$x = -10, 10$

Law of Sines/Law of Cosines

Solve each of the following triangles. Show all steps.

7) $\angle A = 52°$ b = 6 c = 8 SAS



$a^2 = 6^2 + 8^2 - 2(6)(8)\cos(52)$

$a^2 = 36 + 64 - 96\cos(52)$

$a^2 = 100 - 96\cos(52)$

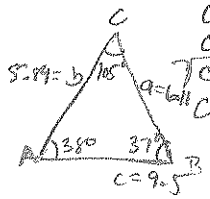
$a = 6.4$

$180 - 52 - 48 = 80°$ $\angle C$

$\frac{\sin(52)}{6.4} = \frac{\sin(B)}{6}$

$B = \sin^{-1}\left(\frac{6\sin(52)}{6.4}\right) = 48°$

8) a = 6.11 b = 5.84 $\angle C = 105°$ SAS



$c^2 = (6.11)^2 + (5.84)^2 - 2(6.11)(5.84)\cos(105°)$

$c^2 = 37.3321 + 34.1056 - 71.3648\cos(105°)$

$c^2 = 71.4377 - 71.3648\cos(105°)$

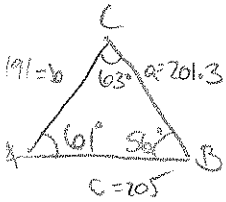
$c = 9.5$

$\frac{\sin(105)}{9.5} = \frac{\sin(A)}{6.11}$

$A = \sin^{-1}\left(\frac{6.11\sin(105)}{9.5}\right) = 38°$

$180 - 105 - 38 = 37°$ $\angle C$

9) $\angle A = 61°$ b = 191 c = 205 SAS



$a^2 = (191)^2 + (205)^2 - 2(191)(205)\cos(61)$

$a^2 = 36481 + 42025 - 78310\cos(61)$

$a^2 = 78506 - 78310\cos(61)$

$a = 201.3$

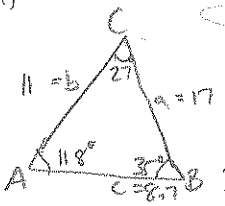
$\frac{\sin(61)}{201.3} = \frac{\sin(B)}{191}$

$180 - 61 - 56 = 63°$ $\angle C$

$B = \sin^{-1}\left(\frac{191\sin(61)}{201.3}\right) = 56°$

10) $\angle A = 118°$ b = 11 a = 17 ASS

$b\sin(A) = 11\sin(118) = 9.7 < 17 > 11$ 1 solution



$\frac{\sin(118)}{17} = \frac{\sin(B)}{11}$

$\frac{11\sin(118)}{17} = \sin(B)$

$B = \sin^{-1}\left(\frac{11\sin(118)}{17}\right)$

$= 35°$

$180 - 118 - 35 = 27° = \angle C$

$\frac{\sin(118)}{17} = \frac{\sin(27)}{c}$

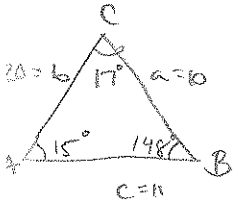
$c\sin(118) = 17\sin(27)$

$c = \frac{17\sin(27)}{\sin(118)}$

$c = 8.7$

1 solution 11) $\angle C = 17°$ a = 10 c = 11 ASS

$b\sin(A) = 10\sin(17) = 2.9 < 11 > 10$



$\frac{\sin(17)}{11} = \frac{\sin(A)}{10}$

$\frac{10\sin(17)}{11} = \sin(A)$

$A = \sin^{-1}\left(\frac{10\sin(17)}{11}\right)$

$A = 15$

$180 - 15 - 17 = 148 = \angle B$

$\frac{\sin(17)}{11} = \frac{\sin(148)}{b}$

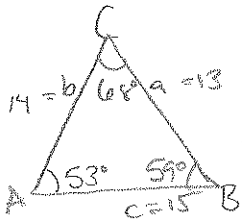
$b\sin(17) = 11\sin(148)$

$b = \frac{11\sin(148)}{\sin(17)}$

$b = 20$

1 solution 12) $\angle C = 68°$ a = 13 c = 15 ASS

$b\sin(A) = 13\sin(68) = 12 < 15 > 13$



$\frac{\sin(68)}{15} = \frac{\sin(A)}{13}$

$\sin(A) = \frac{13\sin(68)}{15}$

$A = \sin^{-1}\left(\frac{13\sin(68)}{15}\right)$

$A = 53°$

$180 - 53 - 68 = 59 = \angle B$

$\frac{\sin(68)}{15} = \frac{\sin(59)}{b}$

$b\sin(68) = 15\sin(59)$

$b = \frac{15\sin(59)}{\sin(68)}$

$b = 14$

Graphing Trig

Graph the following functions

13) $f(x) = 5\cos(x+30) - 1$

Amp: 5

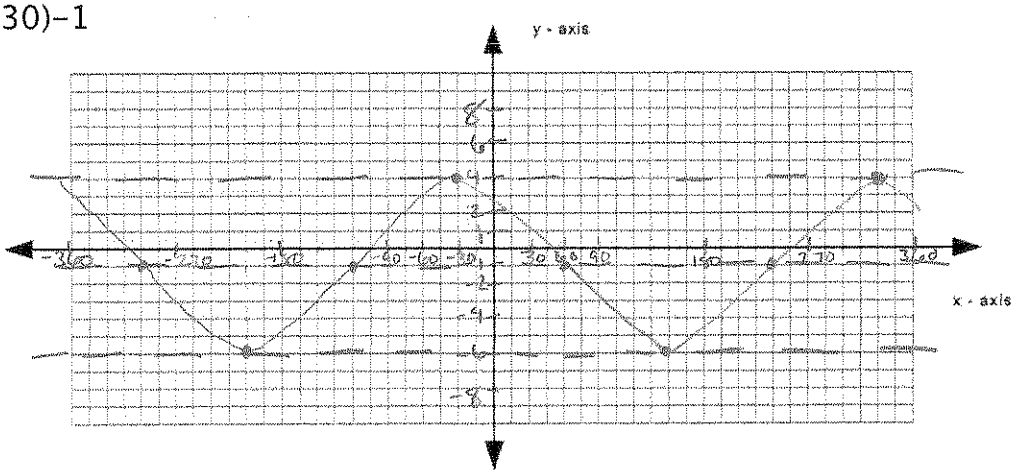
Freq (B): 1

Period: 360

PS: −30

Mid: −1

$\frac{360}{4} = 90$



14) f(x) = −2sin2(x−45)+2

Amp: 2

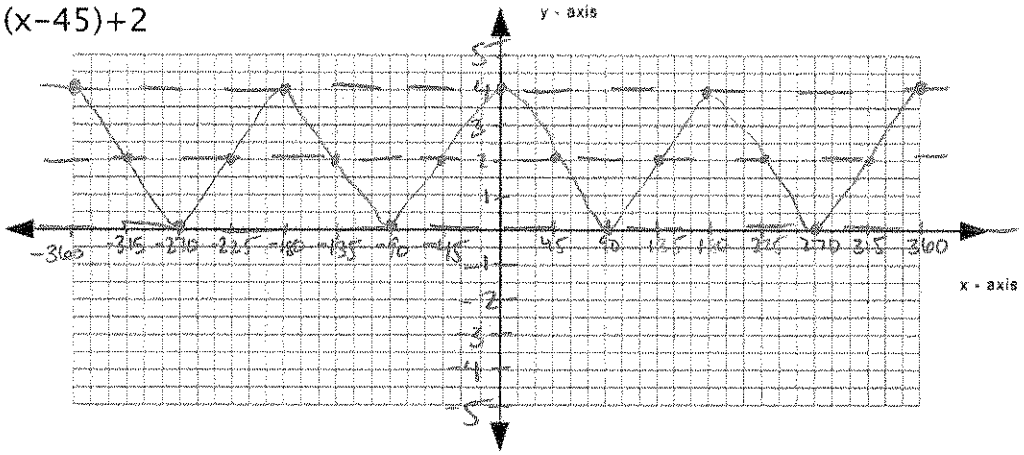
Freq (B): 2

Period: 180

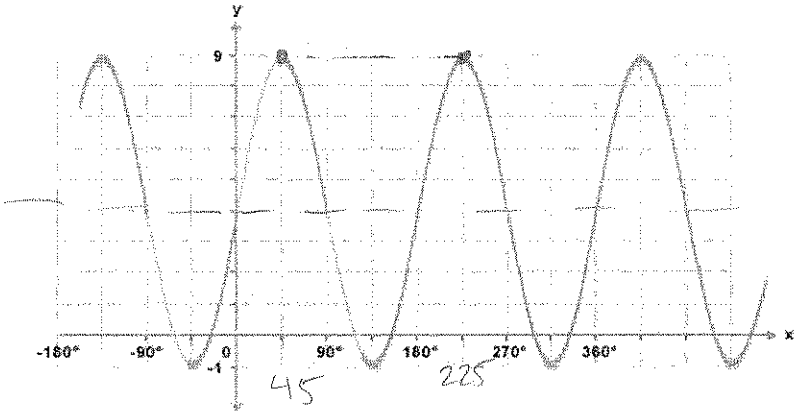
PS: 45

Mid: 2

$\frac{180}{4} = 45$

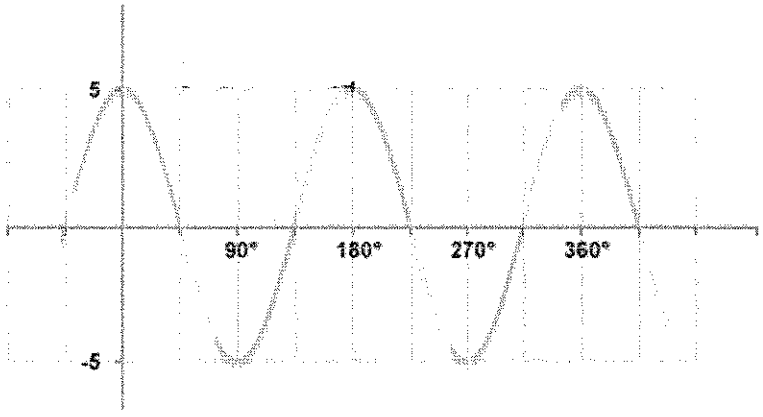


15. Write a sine and cosine equation for each of the following graphs:



Sin: $5\sin 2(x)+4$

Cos: $5\cos 2(x-45)+4$



Sin: $5\sin 2(x+45)+0$

Cos: $5\cos 2(x)+0$

Simplifying

16) $\frac{\cos^2(x)}{1-\cos^2(x)}$

$= \frac{\cos^2(x)}{\sin^2(x)}$

$= \cot^2(x)$

17) $\frac{\sin^2(x)\cot(x)}{\cos(x)}$

$= \frac{\sin^2(x) \cdot \frac{\cos(x)}{\sin(x)}}{\cos(x)}$

$= \frac{\sin(x)\cos(x)}{\cos(x)}$

$= \sin(x)$

18) $\frac{\sec^2(x)-1}{\sin^2(x)}$

$= \frac{\tan^2(x)}{\sin^2(x)}$

$= \frac{\sin^2(x)}{\cos^2(x)} \cdot \frac{1}{\sin^2(x)}$

$= \frac{1}{\cos^2(x)}$

$= \sec^2(x)$

19) $\tan^2(x)[\csc^2(x) - 1]$

$= \tan^2(x) \cdot \cot^2(x)$

$= \frac{\tan^2(x)}{1} \cdot \frac{1}{\tan^2(x)}$

$= 1$

Verify. You can only manipulate one side.

20) $\sin(x)\cot(x) = \cos(x)$

$\sin(x) \cdot \frac{\cos(x)}{\sin(x)} =$

$\cos(x) =$ ✓

21) $\frac{1}{\sec^2(x)} + \frac{1}{\csc^2(x)} - 1 = 0$

$\cos^2(x) + \sin^2(x) - 1 = 0$

$1 - 1 = 0$

$0 = 0$ ✓

22) $\cos^2(x) + \tan^2(x)\cos^2(x) = 1$

$\cos^2(x) + \frac{\sin^2(x)}{\cos^2(x)} \cdot \cos^2(x) =$

$\cos^2(x) + \sin^2(x) =$

$1 =$ ✓

23) $\frac{\cos(x)}{\cot^2(x)} = \sin(x)\tan(x)$

$\frac{\cos(x)}{\frac{\cos^2(x)}{\sin^2(x)}} = \frac{\sin^2(x)}{\cos(x)} =$

$\frac{\cos(x)\sin^2(x)}{\cos^2(x)} = \frac{\sin(x)}{1} \cdot \frac{\sin(x)}{\cos(x)} =$

$\sin(x) \cdot \tan(x) =$ ✓

Solve. Give all answers $0° \leq x < 360°$

24) $2\cos^2(x) - 1 = 0$

$2\cos^2(x) = 1$

$\cos^2(x) = \frac{1}{2}$

$\cos(x) = \pm\frac{\sqrt{1}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}$

$\cos(x) = \frac{\sqrt{2}}{2}$ $\quad \cos(x) = -\frac{\sqrt{2}}{2}$

$x = 45°, 315°$ $\quad x = 135°, 225°$

25) $\sin(x)\cos(x) - \sin(x) = 0$

$\sin(x)(\cos(x) - 1) = 0$

$\sin(x) = 0$ | $\cos(x) - 1 = 0$

$x = \sin^{-1}(0)$ | $\cos(x) = 1$

$x = 0°, 180°$ | $x = \cos^{-1}(1)$

$x = 0°$

26) $\cos^2(x) - 4\cos(x) + 3 = 0$

$x^2 - 4x + 3 = 0$

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

$\cos(x) - 3 = 0$ | $\cos(x) - 1 = 0$

$\cos(x) = 3$ | $\cos(x) = 1$

$x = \cos^{-1}(3)$ | $x = \cos^{-1}(1)$

$x = N/A$ | $x = 0°$

27) $\tan^2(x) - 3 = 0$

$\tan^2(x) = 3$

$\tan(x) = \pm\sqrt{3}$

$\tan(x) = \sqrt{3}$ $\quad \tan(x) = -\sqrt{3}$

$x = \tan^{-1}(\sqrt{3})$ $\quad x = \tan^{-1}(-\sqrt{3})$

$x = 60°, 240°$ $\quad x = 120°, 300°$