Math 4982 - Senior Seminar
Trigonometry Review Questions

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1. [10 pts] Fill out the following table completely:

$\theta°$	$0°$	$30°$	$45°$	$60°$	$90°$	$120°$	$135°$	$150°$	$180°$
θ (rad)									
$\sin(\theta)$									
$\cos(\theta)$									

2. Convert $17°15'$ to decimal degrees.

3. Convert $29.45°$ to degrees, minutes, and seconds.

4. Convert $625°$ to radian measure.

5. Convert $\frac{3}{17}\pi$ radians to degree measure.

6. If the area $\mathcal{A}$ of the sector of a circle with central angle $\theta = \frac{1}{2}$ radians is 100 square units, what is the radius of the circle?

7. Sketch the graph of $f(x) = 2\sin\left(\frac{2}{3}x - \frac{\pi}{2}\right) - 2$ over two full periods.

8. Sketch the graph of $f(x) = \tan(3x + \pi) + 1$ over two full periods.

9. Sketch the graph of $f(x) = \frac{1}{2}\sec\left(2x - \frac{\pi}{4}\right) + 1$ over two full periods.

10. Prove the following trigonometric identity:
$$\frac{\tan^3(t) - \cot^3(t)}{\tan(t) - \cot(t)} = \sec^2(t) + \cot^2(t)$$

11. Prove the following trigonometric identity:
$$\sin(\theta) + \cos(\theta) + 1 = \frac{2\sin(\theta)\cos(\theta)}{\sin(\theta) + \cos(\theta) - 1}$$

12. Prove the following trigonometric identity:
$$\tan(A + B + C) = \frac{\tan(A) + \tan(B) + \tan(C) + \tan(A)\tan(B)\tan(C)}{1 + \tan(A)\tan(B) + \tan(A)\tan(C) + \tan(B)\tan(C)}$$

13. Prove the following trigonometric identity:
$$\frac{\cos(5w) + \cos(w)}{\cos(w) - \cos(5w)} = \frac{\cot(2w)}{\tan(3w)}$$

14. Compute exactly $\tan\left(\frac{\pi}{8}\right)$.

15. Find all solutions for $0 \le x < 2\pi$ to the equation: $\sin(2x - 1) = \frac{1}{2}$.

16. Find all solutions for $0 \leq z < 2\pi$ to the equation: $1 - \sin(z) = \cos(2z)$.

17. Write $\cos(2\tan^{-1}(x))$ as an algebraic expression only, free of trigonometric or inverse trigonometric functions.

18. A triangle has corners given by the points $(1, 2)$, $(-1, 1)$, and $(-3, 4)$. Graph this triangle in the xy-plane and use the vector approach to compute the cosine of each angle in the triangle. Remember $\cos(\theta) = \dfrac{\overrightarrow{u} \cdot \overrightarrow{v}}{|\overrightarrow{u}||\overrightarrow{v}|}$.

19. Given the vector $\overrightarrow{u} = \langle 2, 3, -1, 1, 4 \rangle$, find two nonzero vectors $\overrightarrow{v}$ and $\overrightarrow{w}$ which are perpendicular to $\overrightarrow{u}$ such that $\overrightarrow{v}$ and $\overrightarrow{w}$ do not lie on the same line.