Math 1330
Formula Sheet

$\sin(s + t) = \sin s \cos t + \cos s \sin t$

$\sin(s - t) = \sin s \cos t - \cos s \sin t$

$\cos(s + t) = \cos s \cos t - \sin s \sin t$

$\cos(s - t) = \cos s \cos t + \sin s \sin t$

$$\tan(s + t) = \frac{\tan s + \tan t}{1 - \tan s \tan t}$$

$$\tan(s - t) = \frac{\tan s - \tan t}{1 + \tan s \tan t}$$

$\sin(2t) = 2\sin t \cos t$

$\cos(2t) = \cos^2 t - \sin^2 t$

$$\sin\frac{s}{2} = \pm\sqrt{\frac{1 - \cos s}{2}}$$

$$\cos\frac{s}{2} = \pm\sqrt{\frac{1 + \cos s}{2}}$$

$$\tan\frac{s}{2} = \frac{\sin s}{1 + \cos s}$$

Final Exam: Comprehensive (all chapters)
32 Multiple-choice questions for 1 hour 50 minutes
Must know the unit circle; it will not be provided! Formula-sheet is a LINK! No calculators!
The following questions are provided to help you review and practice; this is NOT a complete list of what you should know.

1. Evaluate the following: (Testing unit circle!!!)

a) $\sin\left(\frac{2\pi}{3}\right)$

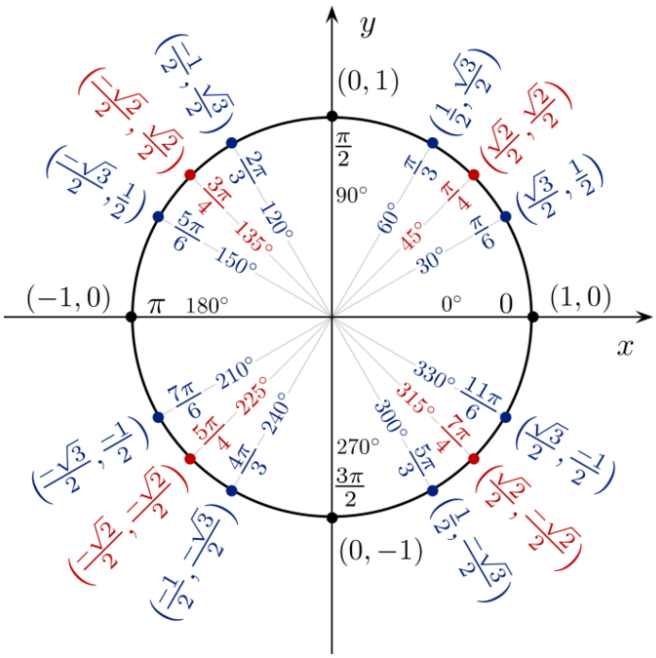
b) $\cos\left(\frac{5\pi}{6}\right)$

c) $\sin\left(-\frac{\pi}{3}\right)$

d) $\tan\left(\frac{2\pi}{3}\right)$

e) $\tan\left(\frac{11\pi}{6}\right)$

f) $\cos\left(-\frac{3\pi}{4}\right)$



2. Evaluate the following:

a) $\sin(10\pi)$

b) $12\cos(25\pi)$

c) $5\cos(24\pi) + 2\sin(15\pi)$

3. Evaluate the following:

a) $\arccos\left(\frac{1}{2}\right)$

b) $\arcsin\left(\frac{\sqrt{2}}{2}\right)$

c) $\arctan(-1)$

d) $\arcsin\left(\frac{\sqrt{3}}{2}\right)$

e) $\arccos(0)$

f) $\arcsin(0)$

The following table lists the most common "inverse trig" function values. Make sure you know these and understand why these are true. If you know the unit circle, you know the values listed here; you just need to think "backwards" and know the range restrictions.

$\arcsin(-1) = -\frac{\pi}{2}$	$\arccos(-1) = \pi$
$\arcsin\left(-\frac{\sqrt{3}}{2}\right) = -\frac{\pi}{3}$	$\arccos\left(-\frac{\sqrt{3}}{2}\right) = \frac{5\pi}{6}$
$\arcsin\left(-\frac{\sqrt{2}}{2}\right) = -\frac{\pi}{4}$	$\arccos\left(-\frac{\sqrt{2}}{2}\right) = \frac{3\pi}{4}$
$\arcsin\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$	$\arccos\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$
$\arcsin(0) = 0$	$\arccos(0) = 0$
$\arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$	$\arccos\left(\frac{1}{2}\right) = \frac{\pi}{3}$
$\arcsin\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$	$\arccos\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$
$\arcsin\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$	$\arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$
$\arcsin(1) = \frac{\pi}{2}$	$\arccos(1) = 0$

$\arctan(-1) = -\frac{\pi}{4}$
$\arctan(0) = 0$
$\arctan(1) = \frac{\pi}{4}$
$\arctan\left(\frac{\sqrt{3}}{3}\right) = \frac{\pi}{6}$
$\arctan\left(\sqrt{3}\right) = \frac{\pi}{3}$
$\arctan\left(-\sqrt{3}\right) = -\frac{\pi}{3}$
$\arctan\left(-\frac{\sqrt{3}}{3}\right) = -\frac{\pi}{6}$

4. Evaluate the following: $\cos\left(\arctan\left(\frac{1}{4}\right)\right)$

5. Evaluate the following: $\sec\left(\arcsin\left(\frac{4}{5}\right)\right)$

6. Given: $0 < \theta < \frac{\pi}{2}$ and $\tan\theta = \frac{1}{3}$, find $\sin\theta$.

7. Given: $\pi < \theta < \frac{3\pi}{2}$ and $\tan\theta = \frac{1}{3}$, find $\sin\theta$.

8. Simplify the following expression: $\dfrac{40\sin(-x)\cos(-x)}{\cos^2 x - \sin^2 x}$

9. Simplify the following expression: $\dfrac{12\cos^2 x + 12\sin^2 x}{\cot(x)}$

10. Find the horizontal shift for the following functions:

a) $f(x) = 2\sin(4x - 12) + 5$

b) $f(x) = 2\cos(3x + 21) + 5$

c) $f(x) = 10\cos(\frac{1}{2}\pi x - \pi) + 5$

d) $f(x) = 10\cos(\frac{1}{8}\pi x + \pi) + 5$

11. Which of the following is a cosine function that has amplitude 10 and period 4?

Choices: a) $y = 10\cos(4x)$

b) $y = 10\cos(2\pi x)$

c) $y = 10\cos\left(\frac{\pi}{2}x\right)$

d) $y = 10\cos\left(\frac{\pi}{4}x\right)$

12. Find the maximum and minimum values of the following functions:

a) $f(x) = 10\sin(4x) + 8$ Max:_____ Min: _____

b) $f(x) = 15\cos(2x) - 4$ Max:_____ Min: _____

13. If x lies in quadrant I and $\sin(x) = \frac{1}{5}$, find the value of $\sin(2x)$.

14. If x lies in quadrant I and $\sin(x) = \frac{1}{4}$, find the value of $\cos(2x)$.

15. If $\angle A$ and $\angle B$ are acute angles with $\sin(A) = \frac{5}{13}$ and $\tan(B) = \frac{3}{4}$;

Find the value of: $\cos(A + B)$.

Find the value of: $\cos(A - B)$.

16. Solve the following equation over the interval $\left[0, \frac{\pi}{2}\right)$:

$$\sin(4x) = -\frac{1}{2} .$$

17. Solve the following equation over the interval $[0, \pi)$:

$$\sin(2x) = -\frac{\sqrt{3}}{2} .$$

18. Solve the following equation over the interval $[0,2\pi)$:

$2\cos(x)+9=10$

19. Solve the following equation over the interval $[0,2\pi)$:

$6\cos(x)+6=0$

20. A ramp leading to the freeway overpass is 190 feet long and rises 32 feet. What is the angle of elevation of the ramp to the freeway?

21. KLM is a triangle with KL = 5, LM = 8, KM =6. Find the value of $\cos(K)$.

22. Let $\vec{a} = 2\vec{i} + 5\vec{j}$ and $\vec{b} = -4\vec{i} + \vec{j}$. Find:

a) $5\vec{a} + 6\vec{b}$

b) Find the magnitude of the vector $\vec{b}$.

c) Find the dot product: $\vec{a} \bullet \vec{b}$.

23. Classify the following:

Choices: Circle, ellipse, hyperbola, parabola, none of the above.

$\frac{(x-5)^2}{9}+\frac{(y+1)^2}{16}=1$

$(y+1)^2=8(x+2)$

$\frac{(x-5)^2}{9}-\frac{(y+1)^2}{16}=1$

$(x+1)^2=-12(y+2)$

$(x-5)^2+(y+1)^2=16$

IDENTIFYING CONIC SECTION NOT IN STANDARD FORM

Classification of Second Degree Equations

When you write a conic section in its general form, you have an equation of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$:

If A, B and C are not all 0, **and if the graph is not degenerate**, then:

- The graph is a **circle** if $B^2 - 4AC < 0$ and $A = C$.
- The graph is an **ellipse** if $B^2 - 4AC < 0$ and $A \neq C$.
- The graph is a **parabola** if $B^2 - 4AC = 0$.
- The graph is a **hyperbola** if $B^2 - 4AC > 0$.

Remember, if there is no "xy" term, then B = 0.

24. Classify the following:

Choices: Circle, ellipse, hyperbola, parabola, none of the above.

$16x^2 + 9y^2 - 32x - 36y - 92 = 0$

$16x^2 - 9y^2 - 32x + 36y - 164 = 0$

$x^2 + 4x - 4y - 8 = 0$

$y^2 + 10y - 4x + 13 = 0$

$x^2 + y^2 + 4x - 6y + 9 = 0$

25. Write the equation of a circle with radius 5 and center (-1,4).

26. Find the center and radius of the following circle: $x^2 + y^2 + 4x - 6y + 9 = 0$

27. State the coordinates of the vertex of the following parabola:

a) $x^2 + 4x - 4y - 8 = 0$

b) $(y+1)^2 = 8(x+2)$

28. State the vertices and find the length of the major and minor axes of the following ellipse:

a) $\frac{x^2}{16}+\frac{y^2}{25}=1$

Major axis_____

Minor axis_____

Vertices_____

b) $\frac{x^2}{49}+\frac{y^2}{25}=1$

Major axis_____

Minor axis_____

Vertices_____

c) $\frac{x^2}{49}+\frac{y^2}{81}=1$

Major axis_____

Minor axis_____

Vertices_____

29. Find the point(s) of intersection:

$$4x^2 + 7y^2 = 23$$
$$3x^2 - y^2 = 11$$

30. Find the difference quotient $\frac{f(x+h)-f(x)}{h}$ for $f(x) = 3x^2 - 5x$.

31. Find the domain of the following functions.

a. $f(x) = \frac{\sqrt{2x-18}}{x-5}$

b. $f(x) = \frac{\sqrt{3x+18}}{x-7}$

32. Solve for x.

a. $2\log(2x+1)-15=-9$

b. $\log_2 x+\log_2(x-2)=3$

33. Find the horizontal and vertical asymptotes of the following functions

a. $f(x) = \frac{x^2-6x+5}{x-3}$

b. $f(x) = \frac{x-7}{x^2-6x-7}$

c. $f(x) = \frac{x^2-9}{x^2-3x-10}$

34. Given $f(x) = 7\ln x$ and $g(x) = e^{2x}$, find

a. $(f \circ g)(2)$

b. $(g \circ f)(3)$