NAME: ____________________

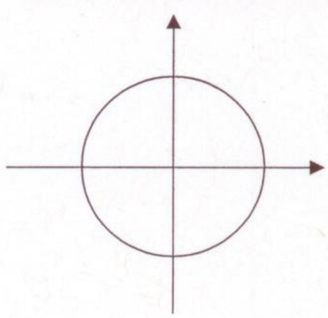
MATH 130 **FINAL EXAM** Spring 2014 FORM B

Part I: The following ten questions are worth 6 points each

1. If $f(x) = -3x^2 - 2x + 5$, $g(x) = 2x + 1$. compute and simplify $f \circ g\,(x) = ?$

2. If $t = -\frac{5\pi}{6}$,

(a) Draw the terminal point on the unit circle and find the reference number for t
(b) Find the exact value of $\sin t$, $\cos t$, $\tan t$



3. If $\tan t = 3$ and $\sin t < 0$, find the exact value of $\cos t$.

4. Find the domain of $f(x) = \dfrac{x-3}{\sqrt{3x-1}}$.

5. Solve the inequality $x^2 + 2x - 15 \le 0$. Write your answer in interval notation

6. Prove the identity: $\csc t - \cos t \cot t = \sin t$

7. Sketch one period of the graph $y = -10\cos(2x + \frac{\pi}{3})$. Label the lowest points, the highest points and the x-intercepts of the graph with their coordinates.

8. A triangle has the following sides: a = 23ft, b = 45 ft, c = 31 ft. Find the measure of its smallest angle only (round off to one decimal place).

9. If $\sin x = -\frac{5}{13}$, (x in quadrant III) use suitable identities to find the exact value of $\tan 2x$. Write your answer as a fraction.

10. (a) Simplify: $\cos\left(\tan^{-1}\frac{1}{x}\right)$ (b) Find the exact value of: $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

Part II: The next five questions are worth 8 points each

11. If $f(x) = \dfrac{x^2 - 4}{4x^2 - 1}$ find:

(a) the coordinates of the x-intercept(s): ____________________

(b) the coordinates of the y-intercept: ____________________

(c) the equation of the vertical asymptote(s): ____________________

(d) the equation of the horizontal asymptote: ____________________

(e) sketch the graph of f together with all the points and lines found above:

12. Find all solutions for x in the interval $[0, 2\pi)$: $2\cos^2 x - \cos x - 1 = 0$

13. If $f(x) = x^3 + 2x^2 - 3x + 20$

(a) Give a complete list of all possible rational zeroes:

(b) Use synthetic division to check for actual rational zeroes:

(c) Find all remaining zeroes:

(d) Write f as a product of linear factors:

f(x) = ______________________________

14. If $y = 2x^2 + 12x + 15$,

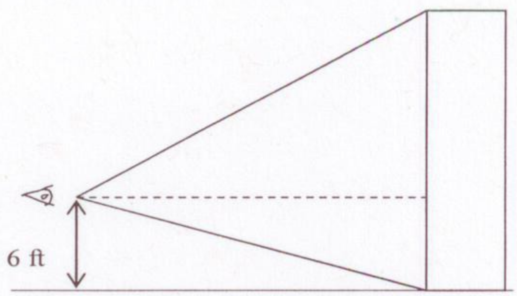
(a) Rewrite the function in the form $y = c(x-h)^2 + k$ or $y - k = c(x-h)^2$

(b) Use part (a) to find the vertex of the graph

(c) Find the y-intercept and the x-intercepts of the graph

15. A surveyor is measuring a building with an eyepiece 6 feet from the ground. From where the surveyor is looking, the angle of elevation of the top of the building is 15°; the angle of depression of foot of the building is 2°. What is the height of the building to the nearest foot:

height = ______________



Important Properties and Formulas

Basic Identities

$$\sin x = \frac{1}{\csc x}, \qquad \sin(-x) = -\sin x,$$

$$\cos(-x) = \cos x,$$

$$\cos x = \frac{1}{\sec x}, \qquad \tan(-x) = -\tan x$$

$$\tan x = \frac{1}{\cot x},$$

$$\tan x = \frac{\sin x}{\cos x},$$

$$\cot x = \frac{\cos x}{\sin x},$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1,$$

$$1 + \cot^2 x = \csc^2 x,$$

$$1 + \tan^2 x = \sec^2 x$$

Sum and Difference Identities

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v,$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v,$$

$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x,$$

$$\tan\left(\frac{\pi}{2} - x\right) = \cot x,$$

$$\sec\left(\frac{\pi}{2} - x\right) = \csc x,$$

$$\sin\left(x \pm \frac{\pi}{2}\right) = \pm\cos x,$$

$$\cos\left(x \pm \frac{\pi}{2}\right) = \mp \sin x$$

Double-Angle Identities

$$\sin 2x = 2 \sin x \cos x,$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$= 1 - 2\sin^2 x$$

$$= 2\cos^2 x - 1,$$

$$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$

Half-Angle Identities

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

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

$$\tan \frac{x}{2} = \pm\sqrt{\frac{1 - \cos x}{1 + \cos x}}$$

$$= \frac{\sin x}{1 + \cos x}$$

$$= \frac{1 - \cos x}{\sin x}$$

Inverse Trigonometric Functions

FUNCTION	DOMAIN	RANGE
$y = \sin^{-1} x$	$[-1, 1]$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
$y = \cos^{-1} x$	$[-1, 1]$	$[0, \pi]$
$y = \tan^{-1} x$	$(-\infty, \infty)$	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

(continued)