

# MATH 111 - Exam 3 - Summer 2011 - Section 1

No books, notes, or calculators allowed.

There is no time limit.

1. Find the exact value of  $\tan^{-1}(-1)$ .

- (a)  $\frac{\pi}{4}$       (b)  $\frac{3\pi}{4}$       (c)  $\frac{5\pi}{4}$       (d)  $\frac{7\pi}{4}$       (e)  $\frac{9\pi}{4}$       (f)  $\frac{11\pi}{4}$

2. Find the exact value of  $\cos^{-1}(\cos(\frac{10\pi}{9}))$ .

- (a)  $\frac{\pi}{9}$       (b)  $\frac{8\pi}{9}$       (c)  $-\frac{7\pi}{9}$       (d)  $-\frac{5\pi}{9}$       (e)  $-\frac{\pi}{9}$       (f)  $\frac{10\pi}{9}$

3. Find the exact value of  $\sin(\cos^{-1}(-\frac{\sqrt{2}}{2}))$ .

- (a)  $\frac{\sqrt{2}}{2}$       (b)  $-\frac{\sqrt{2}}{2}$       (c)  $-\frac{1}{2}$       (d)  $-\frac{\sqrt{3}}{2}$       (e)  $\sqrt{2}$       (f)  $\frac{2}{\sqrt{3}}$

4. Find the exact value of  $\sin(\tan^{-1}(\frac{2}{3}))$ .

- (a)  $\frac{2}{\sqrt{13}}$       (b)  $\frac{3}{\sqrt{13}}$       (c)  $\frac{2}{\sqrt{11}}$       (d)  $\frac{3}{\sqrt{11}}$       (e)  $-\frac{2}{\sqrt{11}}$       (f)  $-\frac{3}{\sqrt{11}}$

5. Write the trigonometric expression  $\tan(\cot^{-1} u)$  as an algebraic expression of  $u$ .

- (a)  $\frac{1}{u}$       (b)  $\frac{1}{\sqrt{u^2-1}}$       (c)  $\frac{1}{\sqrt{u^2+1}}$       (d)  $u$       (e)  $\sqrt{u-1}$       (f)  $\sqrt{u+1}$

6. Write the trigonometric expression  $\cos(\csc^{-1} u)$  as an algebraic expression of  $u$ .

- (a)  $\sqrt{u^2-1}$       (b)  $\sqrt{u^2+1}$       (c)  $\frac{1}{\sqrt{u}}$       (d)  $\frac{\sqrt{u^2+1}}{u}$       (e)  $\frac{\sqrt{u^2-1}}{u}$       (f)  $\frac{1}{u}$

7. Rewrite the expression  $\tan \theta \sec \theta$  in terms of  $\sin \theta$ .

- (a) 0      (b) 1      (c)  $\sin \theta$       (d)  $\sin^2 \theta$       (e)  $\frac{\sin^2 \theta}{1-\sin \theta}$       (f)  $\frac{\sin \theta}{1-\sin^2 \theta}$

8. Simplify the following expression:  $9 \sec^2 \theta - 5 \tan^2 \theta$ .

- (a)  $4 \sec^2 \theta$       (b)  $14 \sec^2 \theta$       (c)  $\sec^2 \theta + 2$       (d)  $4 \sec^2 \theta + 5$       (e)  $9 \sec^2 \theta - 5$       (f)  $5 \sec^2 \theta + 4$

9. Simplify the following expression:  $(1 - \cos^2 \theta)(1 + \cot^2 \theta)$ .

- (a) 0      (c) -1      (e)  $\cos^2 \theta$   
(b) 1      (d)  $\sin^2 \theta$       (f)  $\sin^2 \theta - \cos^2 \theta$

10. Simplify the following expression:  $\sin(\alpha + \beta) + \sin(\alpha - \beta)$ .

- (a)  $2 \sin \alpha \cos \beta$       (c)  $2 \sin \beta \cos \alpha$       (e)  $2 \sin \alpha \sin \beta$   
(b)  $\sin \alpha \cos \beta$       (d)  $\sin \alpha \cos \beta$       (f) 0

11. Simplify the following expression:  $\cos^4 \theta - \sin^4 \theta$ .

- (a)  $\sin 2\theta$       (b)  $\cos 2\theta$       (c)  $2 \sin 2\theta$       (d)  $2 \cos 2\theta$       (e) 1      (f) 0

12. If  $\sin \alpha = \frac{1}{4}$  and  $0 < \alpha < \frac{\pi}{2}$ . Find  $\cos 2\alpha$ .

- (a) 1      (b)  $\sqrt{2}$       (c)  $\frac{1}{\sqrt{2}}$       (d)  $\frac{7}{8}$       (e)  $\frac{3}{16}$       (f)  $\frac{1}{2}$

13. Find the exact value of  $\sin \frac{\pi}{12}$ .

- (a)  $\frac{1}{4}$       (b)  $\frac{\sqrt{3}+\sqrt{2}}{4}$       (c)  $\frac{\sqrt{6}+\sqrt{2}}{4}$       (d)  $\frac{\sqrt{6}-\sqrt{2}}{4}$       (e)  $\frac{-\sqrt{6}-\sqrt{2}}{4}$       (f)  $\frac{\sqrt{2}-\sqrt{6}}{4}$

14. If  $\sin \alpha = \frac{2}{3}$  and  $\frac{\pi}{2} < \theta < \pi$ , find  $\sin 2\alpha$ .

- (a)  $-\frac{\sqrt{5}}{3}$       (d)  $\frac{4\sqrt{5}}{9}$   
(b)  $\frac{4}{3}$       (e)  $-\frac{4\sqrt{5}}{9}$   
(c)  $\frac{\sqrt{5}}{9}$       (f)  $-\frac{\sqrt{5}}{9}$

15. Find the exact value of  $\tan \frac{7\pi}{12}$ .

- (a)  $1 + \sqrt{3}$       (b)  $1 - \sqrt{3}$       (c)  $2 - \sqrt{3}$       (d)  $2 + \sqrt{3}$       (e)  $-2 + \sqrt{3}$       (f)  $-2 - \sqrt{3}$

16. Given that  $\sin \alpha + \sin \beta = 2 \sin \frac{\alpha+\beta}{2} \cos \frac{\alpha-\beta}{2}$ , simplify the following expression:  $\frac{\sin \theta + \sin 3\theta}{2 \sin 2\theta}$ .

- (a)  $\cos \theta$       (b)  $\cos 2\theta$       (c)  $\sin \theta$       (d)  $\sin 2\theta$       (e)  $\tan \theta$       (f)  $\tan 2\theta$

17. Determine the sum of all solutions to the equation  $2 \cos \theta + 1 = 0$  on  $[0, 2\pi)$ .

- (a) 0      (b)  $\frac{\pi}{3}$       (c)  $\pi$       (d)  $\frac{3\pi}{4}$       (e)  $2\pi$       (f)  $3\pi$

18. Determine the total number of solutions to the equation  $2 \sin^2 \theta + \sin \theta - 1 = 0$  on  $[0, 2\pi)$ .

- (a) 0      (b) 1      (c) 2      (d) 3      (e) 4      (f) 5

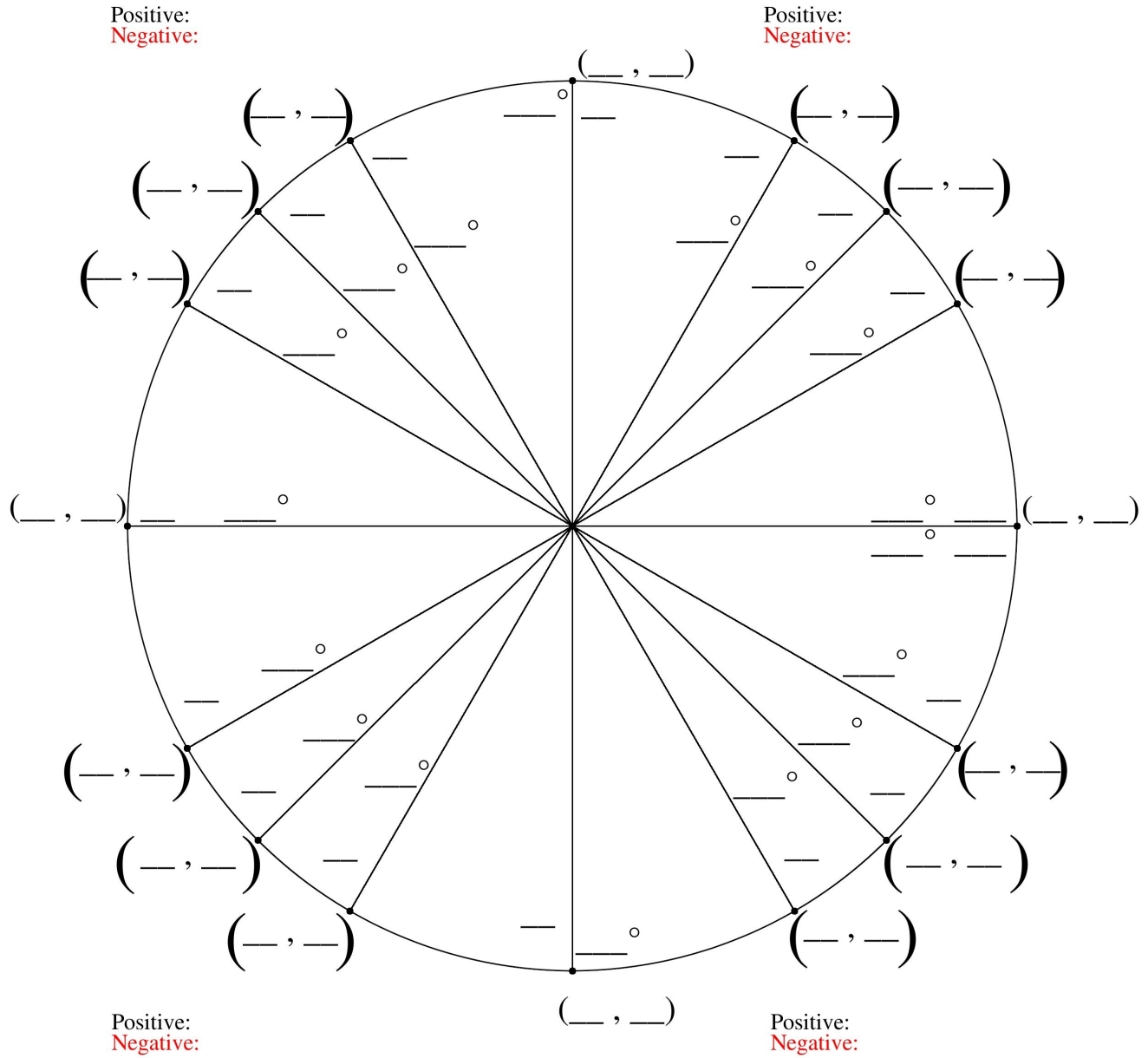
19. Determine the total number of solutions to the equation  $2 \cos^2 \theta - 2 \sin^2 \theta = 2$  on  $[0, 2\pi)$ .

- (a) 0      (b) 1      (c) 2      (d) 3      (e) 4      (f) 5

20. Determine the total number of solutions to the equation  $\sin 2\theta \sin \theta = \cos \theta$  on  $[0, 2\pi)$ .

- (a) 0      (b) 1      (c) 2      (d) 3      (e) 4      (f) 5

# Fill in The Unit Circle



1. d
2. b
3. a
4. a
5. a
6. e
7. f
8. d
9. b
10. a
11. b
12. d
13. d
14. e
15. f
16. a
17. e
18. d
19. c
20. f