

**Precalculus Spring Semester Final Review #2**

1. a. Convert to degrees:  $\theta = \frac{11\pi}{8}$       b. Convert to radians:  $\theta = 245^\circ$  leave answer in terms of  $\pi$

A  $1.35^\circ$

B  $67.5^\circ$

C  $123.75^\circ$

D  $247.5^\circ$

A  $\frac{13\pi}{36}$

B  $\frac{49\pi}{72}$

C  $\frac{49\pi}{36}$

D  $\frac{49\pi}{18}$

2. If the cotangent of an acute angle is  $\frac{3}{4}$ , find the value of the cosecant.

A  $\frac{3}{5}$

B  $\frac{4}{5}$

C  $\frac{5}{4}$

D  $\frac{5}{3}$

3. Find the reference angle for  $\theta = 230^\circ$

A  $-50^\circ$

B  $40^\circ$

C  $50^\circ$

D  $130^\circ$

4. Given  $\tan \theta = 2.5849$ , find  $\theta$

A  $.0451^\circ$

B  $1.2017^\circ$

C  $21.1496^\circ$

D  $68.8504^\circ$

5. Given  $\tan \theta = \frac{24}{7}$  and  $\sec \theta < 0$ , find  $\sin \theta$

A  $\frac{-24}{25}$

B  $\frac{-7}{25}$

C  $\frac{7}{25}$

D  $\frac{24}{25}$

6. Given  $\cos\theta = \frac{2}{7}$  and  $\cot\theta < 0$ , find  $\sin\theta$

A  $\frac{-\sqrt{53}}{7}$

B  $\frac{-3\sqrt{5}}{7}$

C  $\frac{3\sqrt{5}}{7}$

D  $\frac{\sqrt{53}}{7}$

7. A 20 foot ladder rests on the side of a building. If the ladder is 8 feet from the base of the building, find the angle of elevation that the ladder makes with the ground to the nearest degree.

A  $22^\circ$

B  $24^\circ$

C  $66^\circ$

D  $68^\circ$

8. From fire tower A, a fire with bearing  $N78^\circ E$  is sighted. The same fire is sighted from tower B with bearing  $N51^\circ W$ . Tower B is 70 miles directly east of tower A. How far, to the nearest mile, is it from tower A to the fire?

A 19 miles

B 57 miles

C 70 miles

D 88 miles

9. Find the exact value of the expression:  $\sin\left[\tan^{-1}\left(\frac{-12}{5}\right)\right]$

A  $\frac{-12}{13}$

B  $\frac{-5}{13}$

C  $\frac{5}{13}$

D  $\frac{12}{13}$

10. Find the exact value of the expression:  $\csc\left[\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)\right]$

- A -2
- B  $\frac{-\sqrt{21}}{7}$
- C  $\frac{\sqrt{21}}{7}$
- D 2

11. Find the period in degrees:  $f(x) = \sin\left(\frac{1}{3}x\right)$

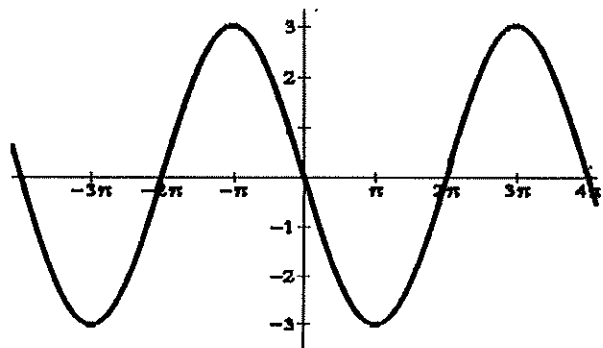
- A  $60^\circ$
- B  $120^\circ$
- C  $540^\circ$
- D  $1080^\circ$

12. Find the period in degrees:  $f(x) = \cos(4x)$

- A  $45^\circ$
- B  $90^\circ$
- C  $720^\circ$
- D  $1440^\circ$

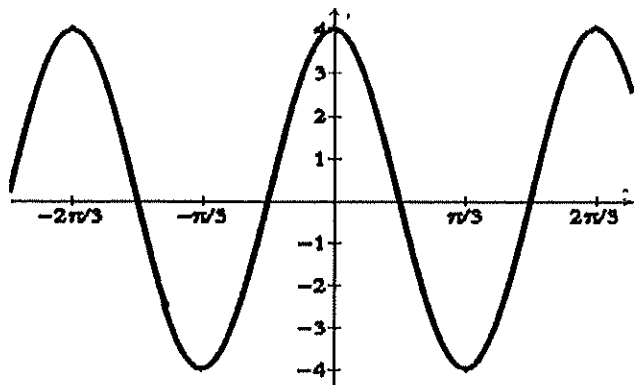
13. Write the sine equation for the following:

- A  $y = -3\sin\left(\frac{\theta}{2}\right)$
- B  $y = -3\sin(2\theta)$
- C  $y = 3\sin\left(\frac{\theta}{2}\right)$
- D  $y = 3\sin(2\theta)$



14. Write the cosine equation for the following:

- A  $y = -4\cos\left(\frac{\theta}{3}\right)$
- B  $y = -4\cos(3\theta)$
- C  $y = 4\cos\left(\frac{\theta}{3}\right)$
- D  $y = 4\cos(3\theta)$



15. Simplify:  $\csc^4 x - \cot^4 x$

- A  $\csc^2 x - \cot^2 x$
- B  $\csc^2 x + \cot^2 x$
- C  $2 \cot^2 x - 1$
- D  $2 \csc^2 x + 1$

16. Simplify:  $\frac{\sec x - \cos x}{\tan^2 x}$

- A  $-1$
- B  $1$
- C  $\sin x$
- D  $\cos x$

17. Perform the addition and simplify:  $\frac{\csc x}{\sin x} - \frac{\cot x}{\tan x}$

- A  $-1$
- B  $0$
- C  $1$
- D  $\sin^2 x - \tan^2 x$

18. Perform the subtraction and simplify:  $\tan x - \frac{\sec^2 x}{\tan x}$

- A  $-\cot x$
- B  $-\tan x$
- C  $\cot x$
- D  $\tan x$

19. Find all solutions in the interval  $[0, 2\pi)$ :  $2 \sin x + \sqrt{3} = 0$

- A  $\frac{\pi}{6}, \frac{5\pi}{6}$
- B  $\frac{\pi}{3}, \frac{2\pi}{3}$
- C  $\frac{7\pi}{6}, \frac{11\pi}{6}$
- D  $\frac{4\pi}{3}, \frac{5\pi}{3}$

20. Find all solutions in the interval  $[0, 2\pi)$ :  $\tan x \sec x = \tan x$

- A 0
- B 0, 1
- C 0,  $\pi$
- D  $0, \frac{\pi}{2}, \pi$

21. Find all solutions in the interval  $[0, 2\pi)$ :  $\csc^2 x - \csc x = 2$

- A  $\frac{\pi}{6}, \frac{3\pi}{2}$
- B  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$
- C  $\frac{7\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}$
- D 2, -1

22. Find all solutions in the interval  $[0, 2\pi)$ :  $2\cos^2 x + 3\cos x + 1 = 0$

- A  $\frac{\pi}{6}, \frac{11\pi}{6}, 0$
- B  $\frac{\pi}{3}, \frac{5\pi}{3}, 0$
- C  $\frac{5\pi}{6}, \frac{7\pi}{6}, \pi$
- D  $\frac{2\pi}{3}, \frac{4\pi}{3}, \pi$

23. Evaluate:  $\sin 165^\circ$  (Use the fact that  $165^\circ = 135^\circ + 30^\circ$ )

- A  $\frac{\sqrt{2} - \sqrt{6}}{4}$
- B  $\frac{\sqrt{6} - \sqrt{2}}{4}$
- C  $\frac{\sqrt{6} + \sqrt{2}}{4}$
- D  $\frac{1 + \sqrt{3}}{2}$

24. Write the expression as the sine, cosine or tangent of an angle:  $\cos 125^\circ \cos 40^\circ - \sin 125^\circ \sin 40^\circ$

- A  $\cos 85^\circ$
- B  $\sin 85^\circ$
- C  $\cos 165^\circ$
- D  $\sin 165^\circ$

25. Given  $\sec u = \frac{-5}{4}$ ,  $\frac{\pi}{2} < u < \pi$  and  $\cot v = \frac{-15}{8}$ ,  $\frac{3\pi}{2} < v < 2\pi$ , find  $\sin(u - v)$

- A  $\frac{-36}{85}$
- B  $\frac{13}{85}$
- C  $\frac{77}{85}$
- D  $\frac{91}{85}$

26. Given  $\csc u = \frac{13}{12}$ ,  $0 < u < \frac{\pi}{2}$  and  $\tan v = \frac{7}{24}$ ,  $\pi < v < \frac{3\pi}{2}$ , find  $\cos(u - v)$

- A  $\frac{-204}{325}$
- B  $\frac{-187}{325}$
- C  $\frac{-36}{325}$
- D  $\frac{437}{325}$

27. Find the area of the triangle (to the nearest tenth) with sides of length 43, 53, and 72.

- A 123.5
- B 1131.9
- C 3712.6
- D 15,099.6

28. In  $\triangle ABC$ ,  $BC = 6$ ,  $AC = 10$ , and  $m\angle C = 120^\circ$ . What is the area of  $\triangle ABC$ ?

- A 15
- B  $15\sqrt{3}$
- C 30
- D  $30\sqrt{3}$

29. Given a triangle with sides  $a=55$ ,  $b=25$ , and  $c=72$ , find  $m\angle C$ .

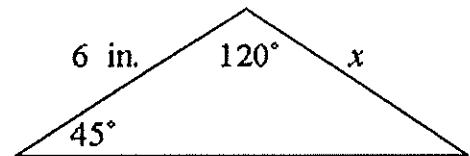
- A  $17^\circ$
- B  $39^\circ$
- C  $56^\circ$
- D  $124^\circ$

30. Given a triangle with sides  $A = 109^\circ$ ,  $b = 13$ , and  $c = 10$ , find  $a$ .

- A 18.81
- B 20.47
- C 23.16
- D 353.65

31. Solve for  $x$  in the given triangle:

- A 2.20 in.
- B 4.39 in.
- C 7.85 in.
- D 16.39 in.



32. Find all possible measures for angle B, given:  $A = 58^\circ$ ,  $a = 11.4$ , and  $b = 12.8$

- A  $72^\circ$
- B  $108^\circ$
- C Both A and B
- D No triangle exists

33. Rewrite the following in trigonometric form:  $5i$

- A  $5(\cos 0 + i \sin 0)$
- B  $5\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}\right)$
- C  $5(\cos \pi + i \sin \pi)$
- D  $5\left(\cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2}\right)$

34. Use DeMoivre's theorem to evaluate:  $[3(\cos 80^\circ + i \sin 80^\circ)]^4$

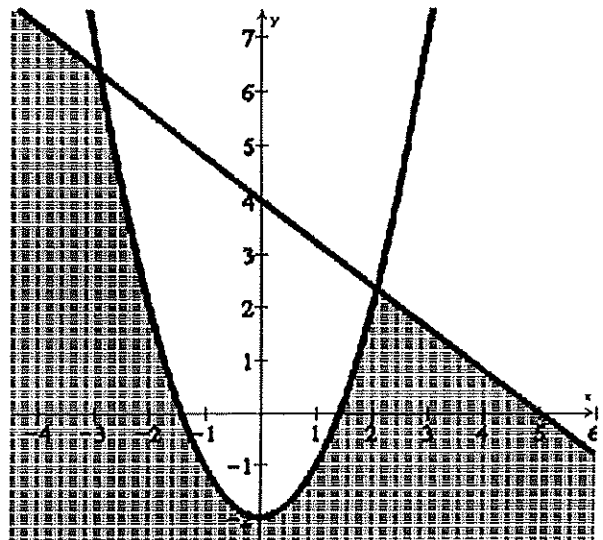
- A  $3(\cos 320^\circ + i \sin 320^\circ)$
- B  $12(\cos 320^\circ + i \sin 320^\circ)$
- C  $81(\cos 80^\circ + i \sin 80^\circ)$
- D  $81(\cos 320^\circ + i \sin 320^\circ)$

35. Determine which of the following is a cube root of  $-64$  using DeMoivre's theorem.

- A  $-4(\cos 180^\circ + i \sin 180^\circ)$
- B  $4(\cos 60^\circ + i \sin 60^\circ)$
- C  $4(\cos 120^\circ + i \sin 120^\circ)$
- D  $64(\cos 60^\circ + i \sin 60^\circ)$

36. Match the graph with the correct system of inequalities.

- A  $\begin{cases} 4x + 5y \leq 20 \\ y \leq x^2 - 2 \end{cases}$
- B  $\begin{cases} 4x + 5y \geq 20 \\ y \geq x^2 - 2 \end{cases}$
- C  $\begin{cases} 4x + 5y \geq 20 \\ y \leq x^2 - 2 \end{cases}$
- D  $\begin{cases} 4x + 5y \leq 20 \\ y \geq x^2 - 2 \end{cases}$





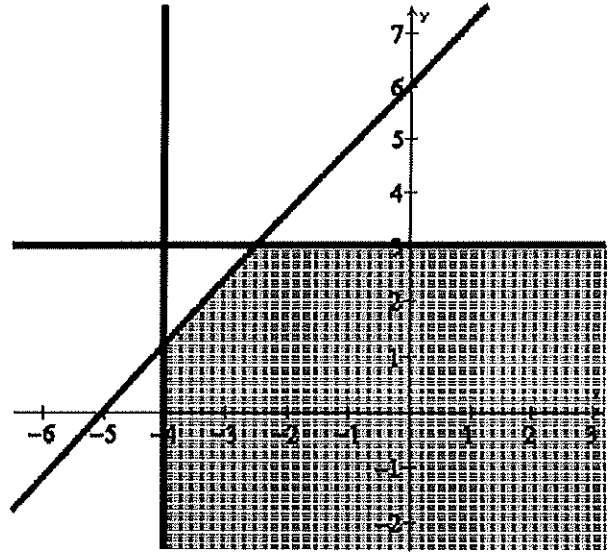
37. Graph the system of inequalities:

**A**  $6x - 5y \geq -30$   
 $x \geq -4$   
 $y \leq 3$

**B**  $6x - 5y \leq -30$   
 $x \geq -4$   
 $y \leq 3$

**C**  $6x - 5y \leq -30$   
 $x \leq -4$   
 $y \geq 3$

**D**  $6x - 5y \geq -30$   
 $x \geq -4$   
 $y \geq 3$



38. A small business invests \$16,000 to produce an item that will sell for \$5.95. Each unit can be produced for \$3.45. Find the sales necessary to break even.

- A 640
- B 1,702
- C 6,400
- D 64,000

39. Solve the following system by the method of Substitution:

$$4x^2 + y = 3$$

$$x + y = -11$$

- A  $(2, -13)$
- B  $\left(\frac{-7}{4}, 2\right)$
- C  $\left(\frac{7}{4}, \frac{-51}{4}\right), (-2, -9)$
- D  $\left(\frac{-7}{4}, \frac{-37}{4}\right), (2, -13)$

40. Solve the system of linear equations:
- $$\begin{aligned} 2x - y + 3z &= 26 \\ 2y - z &= 12 \\ 7x - 5y &= -8 \end{aligned}$$
- A (6, 10, 8)  
 B (11, 8, 4)  
 C (16, 6, 0)  
 D (21, 4, -4)

41. Solve the system of linear equations:
- $$\begin{aligned} 3x - 2y &= 8 \\ x + 2y &= 0 \\ x + y &= 6 \end{aligned}$$
- A (2, -1)  
 B (6 - a, a)  
 C (12, -6)  
 D no solution

42. Solve the system of linear equations:
- $$\begin{aligned} 2x + 4y - 2z &= 0 \\ 3x + 5y &= 1 \end{aligned}$$
- A (-5a + 2, 3a - 1, a)  
 B (5a + 2, -3a - 1, a)  
 C (2, 1, 4)  
 D no solution

43. Given:  $A = \begin{bmatrix} 8 & -1 \\ 2 & 3 \\ -4 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 6 \\ -1 & -5 \\ 1 & 10 \end{bmatrix}$  Find:  $6B - 5A$

A  $\begin{bmatrix} -34 & 41 \\ -16 & -45 \\ 26 & 35 \end{bmatrix}$

B  $\begin{bmatrix} 43 & -36 \\ 17 & 43 \\ -29 & -20 \end{bmatrix}$

C  $\begin{bmatrix} 53 & 24 \\ 7 & -7 \\ -19 & 80 \end{bmatrix}$

D  $\begin{bmatrix} 46 & 31 \\ 4 & -15 \\ -14 & 85 \end{bmatrix}$

44. Find the product of matrices:  $\begin{bmatrix} 9 & 2 & 5 \\ 1 & 0 & 3 \\ 6 & 2 & -4 \end{bmatrix} \begin{bmatrix} 4 & -2 & 7 \\ -7 & 1 & 0 \\ -2 & 2 & 8 \end{bmatrix}$

**A**  $\begin{bmatrix} 12 & -6 & 103 \\ -2 & 4 & 31 \\ 18 & -18 & 10 \end{bmatrix}$

**C**  $\begin{bmatrix} 36 & -2 & 42 \\ -14 & 0 & 0 \\ -10 & 6 & -32 \end{bmatrix}$

**B**  $\begin{bmatrix} 36 & -4 & 35 \\ -7 & 0 & 0 \\ -12 & 4 & -32 \end{bmatrix}$

**D**  $\begin{bmatrix} 76 & 22 & -14 \\ -62 & -14 & -32 \\ 32 & 12 & -36 \end{bmatrix}$

45. Given  $A = \begin{bmatrix} 6 & 15 \\ -8 & -3 \end{bmatrix}$ , Find  $A^{-1}$

**A**  $\begin{bmatrix} \frac{-1}{34} & \frac{-5}{34} \\ \frac{4}{51} & \frac{1}{17} \end{bmatrix}$

**C**  $\begin{bmatrix} \frac{1}{46} & \frac{5}{46} \\ \frac{-4}{69} & \frac{-1}{23} \end{bmatrix}$

**B**  $\begin{bmatrix} \frac{1}{6} & \frac{1}{15} \\ \frac{-1}{8} & \frac{-1}{3} \end{bmatrix}$

**D**  $\begin{bmatrix} -6 & -15 \\ 8 & 3 \end{bmatrix}$

46. Find the determinant of the following matrix:  $\begin{bmatrix} 10 & 8 & 3 & -7 \\ 4 & 0 & 5 & -6 \\ 0 & 3 & 2 & 7 \\ 1 & 0 & -3 & 2 \end{bmatrix}$

- A** -2163
- B** -1167
- C** -453
- D** -399

## Precalculus 2<sup>nd</sup> Semester Final Exam Formulas

### Sum and Difference Formulas

$$\sin(u + v) = \sin u \cos v + \cos u \sin v$$

$$\sin(u - v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u + v) = \cos u \cos v - \sin u \sin v$$

$$\cos(u - v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\tan(u - v) = \frac{\tan u - \tan v}{1 + \tan u \tan v}$$

### Law of Sines / Law of Cosines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

### Area of a Triangle

$$\text{Area} = \frac{1}{2}bc \sin A = \frac{1}{2}ab \sin C = \frac{1}{2}ac \sin B$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$s = \frac{(a+b+c)}{2}$$

### DeMoivre's Theorem

$$z^n = [r(\cos \theta + i \sin \theta)]^n$$

$$z^n = r^n (\cos n\theta + i \sin n\theta)$$

**Remember: Check your mode when doing trig problems!! Good luck have a great summer!!**