

Pre-Calc 12
Midterm 2 Review

Name: _____

Ch 5 Trigonometry Part 1

- Convert 2.3 radians to the nearest degree.
- Convert 50° to radians. Leave answer in terms of π .
- Determine the exact value of the following:
 - $\tan \frac{5\pi}{6}$
 - $\sec 210^\circ$
 - $\cos\left(-\frac{9\pi}{4}\right)$
 - $\cot \frac{\pi}{2}$
 - $\csc(-5\pi)$
 - $\sin \frac{11\pi}{3}$
- What is the exact value of $-3 \tan \frac{13\pi}{6}$?
- If $\cot \theta = -\frac{2}{5}$, and $\csc \theta < 0$, what is the value of $\sin \theta$?
- Determine the amplitude, period, phase shift and vertical displacement of:
 - $y = -3 \cos \frac{2}{15}(x-4) + 1$
 - $y = \sin\left(\frac{\pi}{3}x - \frac{1}{6}\right) - 5$
- Determine the period and equation of the asymptotes of:
 - $y = \tan \frac{1}{2}x$
 - $y = -2 \tan 3x$
- In a circle, an arc of length 30cm contains a central angle of 120° . What is the radius of the circle?
- Graph at least 2 periods of each. Determine the domain and range.
 - $y = 3 \cos(2x - 4\pi) - 1$
 - $y = -2 \sin\left(x + \frac{\pi}{3}\right) + 2$
- What is the range of $f(x) = k \sin\left(x - \frac{\pi}{3}\right) - 3$, if $k > 0$?
- A Ferris wheel at an amusement park has riders get on at the bottom which is 4 m above the ground. The highest point of the ride is 18 m above the ground. The ride takes 60 seconds for one complete revolution.
 - Write an equation that represents the height of a rider with respect to time.
 - How high is a rider 52 seconds after getting on the ride?

Ch 6 Trigonometry Part II

1. Solve in exact form i) for $0 \leq x < 2\pi$ and ii) for all real numbers

a. $\sin 2x = \frac{1}{2}$

b. $\tan\left(\frac{1}{2}x\right) = -1$

c. $4 \sec x + 8 = 0$

2. Solve for $0 \leq x < 2\pi$.

a. $2 \cos^2 x + \cos x - 1 = 0$

b. $\sin^2 x = \sin x$

c. $2 \sin^2 x - 3 \sin x = -1$

3. Find the exact value of each using sum identities:

a. $\sin 75^\circ$

b. $\cos \frac{7\pi}{12}$

c. $\sec\left(-\frac{\pi}{12}\right)$

4. Simplify:

a. $\tan(\pi - 2A)$

b. $\sin(x + y) - \sin(x - y)$

5. Rewrite in terms of sine only: $\frac{\cot x}{\tan x + \sec x}$

6. State the restrictions for: $\frac{3}{4 \sin^2 x - 3}$ if $0 \leq x < 2\pi$.

7. Prove:

a. $\frac{\sin \theta \cos \theta}{1 + \cos \theta} = \frac{1 - \cos \theta}{\tan \theta}$

b. $\frac{1 + \cos 2x}{\sin 2x} = \cot x$

c. $\frac{\sin \theta}{1 - \sin \theta} + \frac{\sin \theta}{1 + \sin \theta} = \sin 2\theta \sec^3 \theta$

8. If $\sin \theta = \frac{5}{6}$ and θ is in QI, find a) $\cos 2\theta$ b) $\sin 2\theta$

Ch 7 Combinatorics

1. A group of four students is to be selected from a class of 27 students.

a. How many different groups can be selected?

b. Mike, Steven and Sarah are students in this class. How many possible groups include all three of these students?

2. Chris invited five friends to his birthday party. His friends did not reply so he is not sure how many are actually coming. How many combinations of guests could actually occur?

3. How many arrangements could be made of the letters of each of the following if **all** the letters must be used in each arrangement?

a. PAANANEN

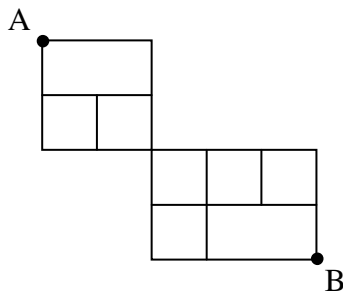
b. CLAREMONT, if C must be the 1st letter and T must be the last letter of each arrangement

c. NELSON, if a vowel must be first

d. CHRISTMAS, if S must be both the first and last letters.

4. Determine the fully simplified expression for the fifth term in the expansion of $(3x - 2y)^7$.

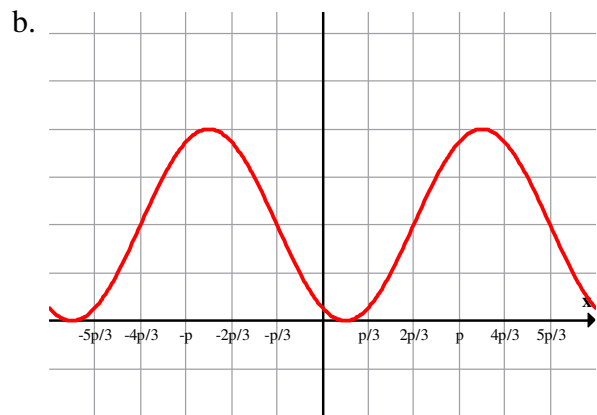
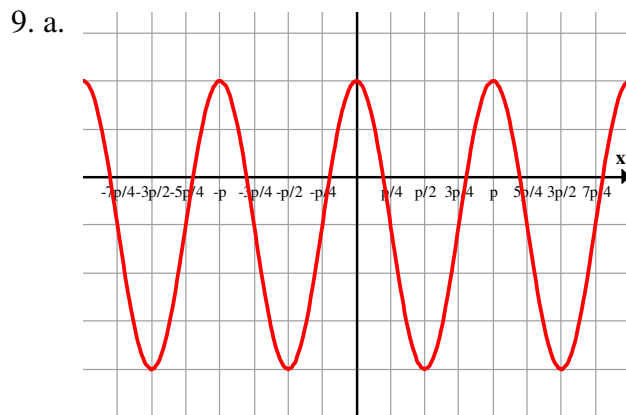
5. How many terms are in the expansion of $(2x - 5y^2)^{11}$?
6. Solve algebraically for n :
- a. $\frac{(3n-2)!}{3!(3n-4)!} = 2$ b. ${}_n P_3 = 120$
7. A group of four journalists is to be chosen to cover a murder trial. There are five male and 7 female journalists available. How many possible groups can be formed if:
- a. The group must consist of 2 men and 2 women
b. The group must have at least 1 woman.
8. Determine the number of pathways to get from A to B going only down &/or to the right:



Answer Key:

Ch 5

1. 132° 2. $\frac{5\pi}{18}$ 3. a. $-\frac{1}{\sqrt{3}}$ b. $-\frac{2}{\sqrt{3}}$ c. $\frac{1}{\sqrt{2}}$ d. 0 e. undefined f. $-\frac{\sqrt{3}}{2}$
4. $\frac{-3}{\sqrt{3}} = -\sqrt{3}$ 5. $-\frac{5}{\sqrt{29}}$ 6. a. amp: 3, per: 15π , ps:4, vd:1 b. amp:1, per:6, ps: $\frac{1}{2\pi}$, vd: -5
7. a. period: 2π , asymptotes: $x = n\pi$, where n is an odd integer
b. period: $\frac{\pi}{3}$, asymptotes: $x = \frac{n\pi}{6}$, where n is an odd integer
8. $\frac{45}{\pi}$ cm = 14.32 cm



10. $-3-k \leq y \leq -3+k$ 11. a. $y = -7 \cos \frac{\pi}{30} x + 11$ or $y = 7 \sin \frac{\pi}{30} (x-15) + 11$ b. 6.32m

Ch 6

1. a. i) $x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$ ii) $x = \frac{\pi}{12} + n\pi, \frac{5\pi}{12} + n\pi, n \in I$ b. i) $x = \frac{3\pi}{2}$ ii) $x = \frac{3\pi}{2} + 2n\pi, n \in I$

c. i) $x = \frac{2\pi}{3}, \frac{4\pi}{3}$ ii) $x = \frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi, n \in I$ 2. a. $x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$ b. $x = 0, \frac{\pi}{2}, \pi$

c. $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}$ 3. a. $\frac{1+\sqrt{3}}{2\sqrt{2}}$ b. $\frac{1-\sqrt{3}}{2\sqrt{2}}$ c. $\frac{2\sqrt{2}}{1+\sqrt{3}}$ 4. a. $-\tan 2A$ b. $2\sin y \cos x$

5. $\frac{1-\sin x}{\sin x}$ 6. $\sin x \neq \pm \frac{\sqrt{3}}{2}, x \neq \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

7. a.

$$\frac{\frac{1-\cos \theta (1+\cos \theta)}{\tan \theta (1+\cos \theta)}}{\frac{1-\cos^2 \theta}{\tan \theta (1+\cos \theta)}} = \frac{\sin^2 \theta}{\left(\frac{\sin \theta}{\cos \theta}\right)(1+\cos \theta)}$$

$$\frac{\sin^2 \theta \cos \theta}{1+\cos \theta \sin \theta} = \frac{\sin \theta \cos \theta}{1+\cos \theta}$$

b.

$$\frac{1+2\cos^2 x-1}{2\sin x \cos x} = \frac{\cos x}{\sin x} = \cot x$$

c. $\frac{\sin \theta (1+\sin \theta)}{(1-\sin \theta)(1+\sin \theta)} + \frac{\sin \theta (1-\sin \theta)}{(1+\sin \theta)(1-\sin \theta)}$

$$\frac{\sin \theta + \sin^2 \theta + \sin \theta - \sin^2 \theta}{1-\sin^2 \theta} = \frac{2\sin \theta \cos \theta}{\cos^2 \theta \cos \theta} = (2\sin \theta \cos \theta) \left(\frac{1}{\cos^3 \theta}\right) = \sin 2\theta \sec^3 \theta$$

8. a. $-\frac{7}{18}$ b. $\frac{5\sqrt{11}}{18}$

Ch7

1. a. 17550 b. 24 2. 32 3. a. 1120 b. 5040 c. 120 d. 5040 4. $15120x^3y^4$
5. 12 6. a. $n=2$ b. $n=6$ 7. a. 210 b. 490 8. 28