

Honors Precalculus

Review for 2nd Semester Final (Juniors)

Chapter 4

1. Convert to radians : 240^0

a) $\frac{3\pi}{4}$

b) $\frac{43200}{\pi}$

c) $\frac{3\pi}{2}$

d) $\frac{4\pi}{3}$

e) None of these

2. Find the point (x, y) on the unit circle that corresponds to the real number $t = \pi$

a) $(0, -1)$

b) $(-1, 0)$

c) $(0, 0)$

d) $(1, 1)$

e) None of these

3. Given θ as an acute angle of a right triangle and $\csc \theta = \frac{7}{3}$, find $\tan \theta$

a) $\frac{2\sqrt{10}}{7}$

b) $\frac{3\sqrt{10}}{20}$

c) $\frac{2\sqrt{10}}{3}$

d) $\frac{3}{7}$

e) None of these

4. Evaluate: $\cot 15^0$

a) 3.7321

b) 0.0012

c) 86.1859

d) 1.0353

e) None of these

5. Find an acute angle θ if $\cos \theta = 0.9872$

a) 80.8229^0

b) 0.9998^0

c) 9.1771^0

d) 1.0001^0

e) None of these

6. Evaluate: $\sec\left(\frac{\pi}{3}\right)$

a) $\frac{\sqrt{2}}{2}$

b) $\frac{\sqrt{3}}{2}$

c) $\frac{\sqrt{3}}{3}$

d) 2

e) None of these

7. A man that is 6 feet tall casts a shadow 14 feet long. Find the angle of elevation of the sun.

a) 23.2°

b) 66.8°

c) 25.4°

d) 64.6°

e) None of these

8. For the angle θ shown at the right, find $\tan \theta$

a) $-\frac{9\sqrt{130}}{7}$

b) $\frac{\sqrt{130}}{7}$

c) $-\frac{7}{9}$

d) $-\frac{9}{7}$

e) None of these

9. Given $\sin \theta = \frac{7}{13}$, and $\tan \theta < 0$, find $\tan \theta$.

a) $-\frac{7\sqrt{3}}{2}$

b) $-\frac{2\sqrt{3}}{2}$

c) $-\frac{2\sqrt{3}}{13}$

d) $-\frac{7\sqrt{30}}{60}$

e) None of these

10. Describe the horizontal shift of the graph of g with respect to the graph of f :

$$g(x) = 4\sin\left(2x - \frac{\pi}{3}\right) \quad \text{and} \quad f(x) = 4\sin(2x)$$

- a) $\frac{\pi}{6}$ units to the left b) $\frac{\pi}{6}$ units to the right
c) $\frac{2\pi}{3}$ units to the left d) $\frac{2\pi}{3}$ units to the right e) None of these

11. Match the graph at the right with the correct function.

- a) $y = 3\sin 4x$ b) $y = 3\sin\left(\frac{x}{4}\right)$
c) $y = 3\cos 4x$ d) $y = 3\cos\left(\frac{x}{4}\right)$ e) None of these

12. Find the period of the function: $y = 3\tan 7x$

- a) $\frac{\pi}{3}$ b) $\frac{\pi}{7}$
c) $\frac{2\pi}{7}$ d) 6π e) None of these

13. Evaluate: $\arccos 0$

- a) 0 b) π
c) $\frac{\pi}{2}$ d) $-\frac{\pi}{2}$ e) None of these

14. Evaluate: $\cos\left[\arctan\left(-\frac{2}{3}\right)\right]$

a) $-\frac{3\sqrt{13}}{13}$

b) $\frac{3\sqrt{13}}{13}$

c) $-\frac{2\sqrt{13}}{13}$

d) $\frac{2\sqrt{13}}{13}$

e) None of these

15. Write an algebraic expression for $\tan[\arcsin x]$

a) $\frac{x\sqrt{1+x^2}}{1+x^2}$

b) $\frac{1}{x}$

c) $\frac{\sqrt{1-x^2}}{x}$

d) $\frac{x\sqrt{1-x^2}}{1-x^2}$

e) None of these

16. A ladder is leaning against the side of a house. The base of the ladder is 5 feet from the wall and makes an angle of 39° with the ground. Find the length of the ladder.

a) 3.89 feet

b) 6.43 feet

c) 4.05 feet

d) 7.95 feet

e) None of these

Chapter 4

1. Find the point (x, y) on the unit circle that corresponds to the real number $t = \frac{5\pi}{6}$.

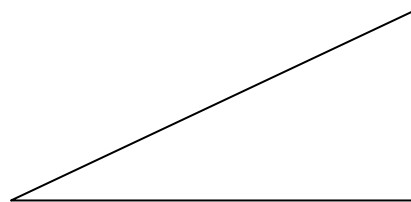
2. Evaluate: $\arctan(-\sqrt{3})$

3. Convert the angle $\theta = 128^{\circ}35'18''$ to (degree) decimal form.

4. In the triangle shown at the right,

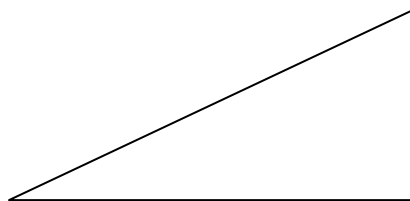
Use the fact that $\sin \theta = \frac{2}{5}$ to

find $\tan \theta$.



5. Find two values of θ in radians ($0 \leq \theta < 2\pi$) that satisfy the equation $\csc \theta = 1.4736$.

7. Find x in the triangle shown at the right.



8. Given that $\tan \theta = -\frac{7}{8}$ and $\cos \theta > 0$, find $\csc \theta$.

9. Determine the period and amplitude of the function: $f(x) = -7 \cos 3x$

10. Sketch the graph of the function: $f(x) = \frac{1}{2} \sec\left(x - \frac{\pi}{2}\right)$

11. Evaluate: $\cos\left[\arctan\left(-\frac{3}{10}\right)\right]$

12. The angle of depression from the top of one building to the foot of a building across the street is 63° . The angle of depression to the top of the same building is 33° . The two buildings are 40 feet apart. What is the height of the shorter building?

Chapter 5

1. Simplify: $\sec x \cos\left(\frac{\pi}{2} - x\right)$

a) 1

b) $\frac{1}{\cos^2 x}$

c) $\tan x$

d) $\cot x$

e) None of these

2. Given $\csc x = -3$ and $\tan x > 0$, find $\cos x$.

a) $\frac{2\sqrt{2}}{3}$

b) $-\frac{3\sqrt{2}}{2}$

c) $-\frac{2\sqrt{2}}{3}$

d) $\frac{3\sqrt{2}}{2}$

e) None of these

3. Rewrite: $\frac{\cot^2 \theta + 1}{\cos^2 \theta - 1}$

a) $-\frac{1}{\sin^4 \theta}$

b) -1

c) $\csc^4 \theta$

d) $\cot^2 \theta$

e) None of these

4. Simplify: $\frac{1 + \cos \theta}{\sin \theta} + \frac{\sin \theta}{1 + \cos \theta}$

a) $\frac{1 + \cos \theta + \sin \theta}{\sin \theta + \sin \theta \cos \theta}$

b) $1 + 2 \cos \theta + \cos^2 \theta$

c) $\frac{2}{\sin \theta}$

d) $\cos^2 \theta$

e) None of these

5. Simplify: $\frac{\cos x}{1 + \sin x}$

- a) $\cos x + \cot x$ b) $\sec x - \tan x$
 c) $\sec x - \cot x$ d) $\cos x + \tan x$ e) None of these

6. Factor and simplify: $\sec^4 x - 2\sec^2 x \tan^2 x + \tan^4 x$

- a) -1 b) $\sec x - \tan x$
 c) $\sec x + \tan x$ d) 1 e) None of these

7. Simplify: $\sin 8x \cos 2x + \cos 8x \sin 2x$

- a) $\sin 10x$ b) $\sin 6x$
 c) $\cos 10x$ d) $\cos 6x$ e) None of these

8. Simplify: $y = \pm \sqrt{\frac{1 - \cos 16x}{2}}$

- a) $y = \sin 32x$ b) $y = \cos 32x$
 c) $y = \sin 8x$ d) $y = \cos 8x$ e) None of these

9. Rewrite as a product: $\sin 7\theta - \sin 3\theta$

- a) $2\sin 5\theta \cos 2\theta$ b) $2\cos 5\theta \sin 2\theta$
 c) $2\cos 5\theta \cos 2\theta$ d) $-2\sin 5\theta \cos 2\theta$ e) None of these

10. Rewrite as a sum: $\sin 3x \cos 4y$

a) $\frac{1}{2}[\sin(3x + 4y) + \sin(3x - 4y)]$

b) $\frac{1}{2}[\sin(3x + 4y) - \sin(3x - 4y)]$

c) $2[\cos(3x + 4y) + \cos(3x - 4y)]$

d) $2[\sin(3x - 4y) + \cos(3x - 4y)]$

e) None of these

11. Find all solutions in the interval $[0, 2\pi)$: $\tan \frac{x}{4} = \frac{\sqrt{3}}{3}$

a) $\frac{2\pi}{3}$

b) $\frac{10\pi}{3}$

c) $\frac{\pi}{4}$

d) $\frac{\pi}{4}, \frac{5\pi}{4}$

e) None of these

12. Find all solutions in the interval $[0, 2\pi)$: $2\sin x \cos x + \cos x = 0$

a) $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$

b) $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

c) $\frac{5\pi}{6}, \frac{11\pi}{6}$

d) $0, \pi$

e) None of these

Chapter 5

1. Use the trigonometric identities to simplify: $\frac{\csc x \cos^2 x}{1 + \csc x}$
2. For what values of θ , $0 \leq \theta < 2\pi$ is it true that $\sec \theta = -\sqrt{1 + \tan^2 \theta}$
3. Simplify: $\sin\left(\frac{\pi}{2} + x\right)\cos(-x)$
4. Factor and simplify: $1 + 2\tan^2 \theta + \tan^4 \theta$
5. Subtract and simplify: $\frac{1 + \sin \theta}{\cos \theta} - \frac{\cos \theta}{\sin \theta - 1}$
6. Verify the identity: $\frac{\tan^2 x + 1}{\tan^2 x} = \csc^2 x$
7. Simplify: $\frac{\tan 7x + \tan 5x}{1 - \tan 7x \tan 5x}$
8. Given $\sin x = -\frac{1}{8}$ and $\tan x < 0$, find $\sin 2x$
9. Rewrite in terms of the first power of cosine: $\cos^2 2x \sin^2 2x$
10. Rewrite as a sum : $\frac{1}{4} \cos 12x \cos 4x$
11. Rewrite as a product: $\sin(x + 2y) - \sin(x - 2y)$
12. Find all solutions in the interval $[0, 2\pi)$: $3\tan^2 2x - 1 = 0$
13. Find all solutions in the interval $[0, 2\pi)$: $2\sin^2 x = \sin x$

Chapter 8

1. Write out the first 5 terms of the sequence whose n th term is $a_n = n!$
(Assume that n begins with 0)

- a) 0,1,2,6,24 b) 1,1,2,6,24
c) 1,1,2,6,12 d) 0,1,2,6,12 e) None of these

2. Find the sum: $\sum_{n=1}^4 \frac{n+1}{n+2}$

- a) $\frac{61}{20}$ b) $\frac{31}{20}$
c) $\frac{143}{60}$ d) $\frac{131}{60}$ e) None of these

3. Write an expression for the n th term of the sequence. (Assume that n begins with 1)

$$\left\{ \frac{1}{4}, \frac{2}{9}, \frac{3}{16}, \frac{4}{25}, \dots \right\}$$

- a) $a_n = 1 - \frac{3n}{n^2}$ b) $a_n = \frac{n}{(n+1)!}$
c) $a_n = \frac{1}{2} + \frac{n}{(n+1)^3}$ d) $a_n = \frac{n}{(n+1)^2}$ e) None of these

4. Find the 99th term of the arithmetic sequence with $a_1 = 7$ and $d = -3$.

- a) -287 b) -290
c) -293 d) -297 e) None of these

5. Find the sum of the first 50 terms of the arithmetic sequence: $\{25, 35, 45, 55, 65, \dots\}$

a) 27,000

b) 13,750

c) 12,875

d) 13,500

e) None of these

6. Write the first five terms of the geometric sequence with $a_1 = 2$ and $r = \frac{2}{3}$

a) $2, \frac{4}{3}, \frac{8}{9}, \frac{16}{27}, \frac{32}{81}$

b) $2, 3, \frac{9}{2}, \frac{27}{4}, \frac{81}{8}$

c) $2, \frac{8}{3}, \frac{10}{3}, 4, \frac{14}{3}$

d) $2, \frac{4}{3}, \frac{2}{3}, -\frac{2}{3}$

e) None of these

7. Find the sum of the infinite series: $1 + 0.9 + 0.81 + 0.729 + \dots$

a) 23

b) 90

c) 10

d) 57

e) None of these

8. Find the 20th term of the geometric sequence with $a_1 = 5$ and $r = 1.1$

a) 1.1665

b) 37.0012

c) 33.6375

d) 30.5795

e) None of these

9. Find a formula for the nth term of the sequence: $\left\{ \frac{2}{1}, \frac{4}{1}, \frac{6}{2}, \frac{8}{6}, \frac{10}{24}, \dots \right\}$

a) $\frac{2^n}{(n+1)!}$

b) $\frac{3-2^n}{n(2^n)}$

c) $\frac{2^n}{2n-1}$

d) $\frac{2n}{(n-1)!}$

e) None of these

10. Find the first five terms of the geometric sequence with $a_1 = 3$ and $r = \frac{3}{2}$

a) $3, \frac{9}{2}, \frac{27}{4}, \frac{81}{8}, \frac{243}{16}$

b) $3, 2, \frac{4}{3}, \frac{8}{9}, \frac{16}{27}$

c) $3, \frac{9}{2}, 6, \frac{15}{2}, 9$

d) $3, \frac{3}{2}, 0, -\frac{3}{2}, -3$

e) None of these

11. Find the formula for the nth partial sum of the sequence.

$$\left\{ \frac{1}{1 \cdot 3}, \frac{1}{3 \cdot 5}, \frac{1}{5 \cdot 7}, \frac{1}{7 \cdot 9}, \frac{1}{9 \cdot 11}, \dots, \frac{1}{(2n-1)(2n+1)}, \dots \right\}$$

a) $\frac{n(n^2-1)}{3}$

b) $\frac{n}{n+1}$

c) $\frac{n}{2n+1}$

d) $\frac{n+1}{2n}$

e) None of these

Chapter 8

1. Write the first 4 terms of the sequence whose n th term is $\frac{n!}{(n+2)!}$. Assume that n begins with 1.

2. Find the sum: $\sum_{i=1}^7 2(i+1)$

3. Find a_n for the arithmetic sequence with $a_1 = 12$, $d = \frac{1}{3}$, and $n = 52$

4. Find the sum of the first 30 terms in the sequence.

$$\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, 5\sqrt{2}, \dots$$

5. Determine if the sequence $\left\{3, -2, \frac{4}{3}, -\frac{8}{9}, \frac{16}{27}, \dots\right\}$ is geometric. If it is, find r .

Chapter 9

1. Write the equation of the directrix of the parabola: $x^2 - 2x - y - 1 = 0$

a) $x = 1$

b) $y = \frac{1}{4}$

c) $4y + 9 = 0$

d) $9x - 4 = 0$

e) None of these

2. Find the equation of the parabola with vertex $(3,1)$ and focus $(4,1)$

a) $y^2 - 4x - 2y + 13 = 0$

b) $4y^2 - x - 8y + 7 = 0$

c) $x^2 - 6x - 4y + 13 = 0$

d) $4x^2 - 24x - y + 37 = 0$

e) None of these

3. Find one focus for the ellipse: $16x^2 + 9y^2 - 160x - 36y + 292 = 0$

a) $(5 - \sqrt{7}, 2)$

b) $(5, 2 + \sqrt{7})$

c) $(9, 2)$

d) $(5, -2)$

e) None of these

4. Find the equation of the ellipse with minor axis of length 8 and vertices at $(-9, 3)$ and $(7, 3)$

a) $4x^2 + 8y^2 - 8x - 48y = 0$

b) $16x^2 + 64y^2 + 32x - 384y - 432 = 0$

c) $64x^2 + 128y^2 - 128x - 768y - 6976 = 0$

d) $x^2 + y^2 + 8x + 8y + 64 = 0$

e) None of these

5. Determine an equation for the hyperbola with center $(0, -2)$, one vertex at $(0, -4)$ and one focus at $(0, 2)$

a) $\frac{x^2}{12} - \frac{(y+2)^2}{4} = 1$

b) $\frac{x^2}{4} - \frac{(y+2)^2}{4} = 1$

c) $\frac{(y+2)^2}{4} - \frac{x^2}{12} = 1$

d) $\frac{(y+2)^2}{12} - \frac{x^2}{4} = 1$

e) None of these

6. Identify the graph of $\frac{(x-3)^2}{2} - \frac{(y+1)^2}{9} = 1$

a)

b)

b)

d)

e) None of these

Chapter 9

1. Sketch the graph of the parabola $y^2 + 8x - 6y + 17 = 0$.
Identify the vertex, focus and directrix.
2. Write the standard equation of the parabola with its vertex at $(1, 4)$ and its focus at $(1, 7)$.
3. Find the center, vertices, foci and eccentricity of the ellipse, then sketch the graph.

$$\frac{(x-2)^2}{1} + \frac{(y+7)^2}{9} = 1$$

4. Find the length of the conjugate axis of the hyperbola:
 $-2x^2 + 9y^2 - 20x - 108y + 256 = 0$
5. Sketch a graph and show the center, vertices, foci and asymptotes of the hyperbola.

$$\frac{(x+1)^2}{2} - \frac{(y+3)^2}{3} = 1$$

Answers to 2nd Semester Review

Chapter 4 – Multiple Choice

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. d | 2. b | 3. b | 4. a | 5. c | 6. d | 7. a |
| 8. d | 9. d | 10. b | 11. a | 12. b | 13. c | 14. b |
| 15. d | 16. b | | | | | |

Free Response

- | | | | |
|--|--|--------------------------------|----------------------------|
| 1. $\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right)$ | 2. $-\frac{\pi}{3}$ | 3. 128.5883^0 | 4. $\frac{2\sqrt{21}}{21}$ |
| 5. $\frac{\sqrt{3}}{3}$ | 6. $\theta = .7459$
$\theta = 2.3957$ | 7. 6.5756 | 8. $-\frac{\sqrt{113}}{7}$ |
| 9. Period: $\frac{2\pi}{3}$ | 10. | 11. $\frac{10\sqrt{109}}{109}$ | 12. 52.5281 |

Amplitude: 7

Chapter 5 – Multiple Choice

- | | | | | | | |
|------|------|-------|-------|-------|------|------|
| 1. c | 2. c | 3. a | 4. c | 5. b | 6. d | 7. a |
| 8. c | 9. b | 10. a | 11. a | 12. b | | |

Free Response

- | | | | |
|-----------------|--|---------------|--------------------|
| 1. $1 - \sin x$ | 2. $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$ | 3. $\cos^2 x$ | 4. $\sec^4 \theta$ |
|-----------------|--|---------------|--------------------|

$$5. \frac{2(1+\sin \theta)}{\cos \theta}$$

$$6. \frac{\tan^2 x + 1}{\tan^2 x} = 1 + \frac{1}{\tan^2 x} = 1 + \cot^2 x = \csc^2 x$$

$$7. \tan 12x$$

$$8. -\frac{3\sqrt{7}}{32}$$

$$9. \frac{1 - \cos 8x}{8}$$

$$10. \frac{\cos 8x + \cos 16x}{8}$$

$$11. 2 \cos x \sin 2y$$

$$12. \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$$

$$13. 0, \frac{\pi}{6}, \frac{5\pi}{6}, \pi$$

Chapter 9 – Multiple Choice

$$1. c \quad 2. a \quad 3. b \quad 4. b \quad \frac{(x+1)^2}{64} + \frac{(y-3)^2}{16} = 1 \quad 5. c \quad 6. a$$

Free Response

$$1. x = -\frac{1}{8}(y-3)^2 - 1 \quad \text{Vertex: } (-1, 3) \quad \text{Focus: } (-3, 3) \quad \text{Directrix: } x = 1$$

$$2. y = \frac{1}{12}(x-1)^2 + 4$$

$$3. \text{Center: } (2, -7), \text{Vertices: } (2, -4)(2, -10), \text{Foci: } (2, -7 \pm 2\sqrt{2}), \quad e = \frac{2\sqrt{2}}{3}$$

a. 6

$$5. \text{Center: } (-1, -3), \text{Vertices: } (-1 \pm \sqrt{2}, -3) \text{Foci: } (-1 \pm \sqrt{5}, -3)$$

$$\text{Asymptotes: } y = -3 - \frac{\sqrt{6}}{2}(x+1)$$