

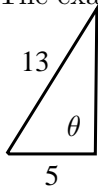
Class Hour: _____

Name: _____

Part I. Multiple Choice. Circle the **LETTER** corresponding to the correct answer. Worth two points each.

1. The horizontal asymptote of the graph of $f(x) = \frac{20 - 7x - 3x^2}{12 - 4x - x^2}$ is
 - A. $y = 3x$
 - B. $y = 3$
 - C. $y = -3$
 - D. $y = \frac{5}{3}$
2. Convert 160° to radians.
 - A. $\frac{4\pi}{3}$
 - B. $\frac{7\pi}{3}$
 - C. $\frac{7\pi}{9}$
 - D. $\frac{8\pi}{9}$
3. If θ is an acute angle and if $\sin \theta = 4/5$, then $\cot(90^\circ - \theta) =$
 - A. $3/5$
 - B. $4/3$
 - C. $5/3$
 - D. $3/4$
4. $1/\sin \theta =$
 - A. $\cos \theta$
 - B. $\csc \theta$
 - C. $\sec \theta$
 - D. $\sin^{-1} \theta$
5. $\sin(x + y)$ equals
 - A. $\cos x \cos y - \sin x \sin y$
 - B. $\sin x \cos y - \cos x \sin y$
 - C. $\cos x \cos y - \sin x \sin y$
 - D. $\sin x \cos y + \cos x \sin y$

6. The exact value of $\tan \theta$ is



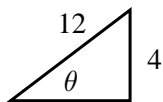
- A. $13/5$
B. $\sqrt{194}/5$
C. $12/5$
D. $5/15$
7. $\sin\left(\frac{\pi}{3} + \frac{\pi}{4}\right) =$
A. $\frac{\sqrt{6} + \sqrt{2}}{4}$
B. $\frac{\sqrt{2} - \sqrt{6}}{4}$
C. $\frac{\sqrt{6} - \sqrt{2}}{4}$
D. $-\frac{\sqrt{6} + \sqrt{2}}{4}$
8. $\cos(15^\circ) =$
A. $\frac{\sqrt{2 + \sqrt{3}}}{2}$
B. $\frac{\sqrt{2 - \sqrt{3}}}{2}$
C. $\frac{\sqrt{2 + \sqrt{2}}}{2}$
D. $\frac{\sqrt{2 - \sqrt{2}}}{2}$
9. $\frac{2 \tan 165^\circ}{1 - \tan^2 165^\circ}$
A. $\sqrt{3}/3$
B. $\sqrt{3}$
C. $-\sqrt{3}/3$
D. $-\sqrt{3}$
10. Find the area of the triangle with $a = 3$, $b = 4$, and $c = 5$.
A. 4
B. 5
C. 6
D. 7

11. Choose the best answer for side c of $\triangle ABC$ if $a = 4$, $b = 5$ and $C = 35^\circ$.
- A. 2.9
 - B. 3.4
 - C. 3.9
 - D. 4.4
12. The polar form of $-2 + 2i$ is
- A. $2\sqrt{2}(\cos(\pi/4) + i \sin(\pi/4))$
 - B. $2\sqrt{2}(\cos(3\pi/4) + i \sin(3\pi/4))$
 - C. $2\sqrt{2}(\cos(5\pi/4) + i \sin(5\pi/4))$
 - D. $2\sqrt{2}(\cos(7\pi/4) + i \sin(7\pi/4))$
13. If $\mathbf{u} = 2\mathbf{i} - 3\mathbf{j}$, and $\mathbf{v} = 4\mathbf{i} - 3\mathbf{j}$, then $\mathbf{u} \cdot \mathbf{v} =$
- A. 8
 - B. $8\mathbf{i} + 9\mathbf{j}$
 - C. 17
 - D. -1
14. The absolute value $|2 - 5i|$ is
- A. $2 + 5i$
 - B. 3
 - C. 5
 - D. $\sqrt{29}$
15. The parabola $y^2 = -16x$ has focus
- A. $(0, 4)$
 - B. $(0, -4)$
 - C. $(4, 0)$
 - D. $(-4, 0)$
16. $x^2 - 4y^2 + 4x - 8y - 10 = 0$ is the equation of
- A. an ellipse
 - B. a parabola
 - C. a hyperbola
 - D. a circle
17. The coordinates of the foci of $\frac{x^2}{5} + \frac{y^2}{9} = 1$ are
- A. $(0, \pm 2)$
 - B. $(0, \pm 3)$
 - C. $(0, \pm\sqrt{5})$
 - D. $(0, \pm\sqrt{14})$

18. If $a_1 = 5$ and $a_{n+1} = 3a_n - 6$, then $a_3 =$
- A. 3
B. 9
C. 21
D. 30
19. The 325th term of the arithmetic sequence $4, 9, 14, \dots$ is
- A. 1624
B. 1629
C. 1504
D. 1509
20. $\sum_{n=1}^3 (-1)^{n+1} n^2 =$
- A. -14
B. 14
C. -6
D. 6

Part II. You must show your work to receive credit when more than one step is required to justify an answer. Worth six points each.

21. Find the exact values for the six trigonometric functions of the angle θ in the given right triangle. Rationalize the denominator where necessary.



$\sin \theta =$

$\csc \theta =$

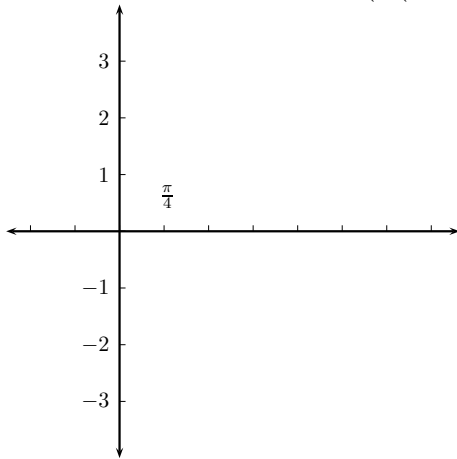
$\cos \theta =$

$\sec \theta =$

$\tan \theta =$

$\cot \theta =$

22. Graph one cycle of $y = 3 \sin \left(2 \left(x - \frac{\pi}{4} \right) \right)$



23. Find the exact value of $\sin \left(\cos^{-1} \left(-\frac{1}{4} \right) \right)$

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

25. Verify the identity: $\frac{\cos(x - y)}{\sin x \sin y} = \cot x \cot y + 1$

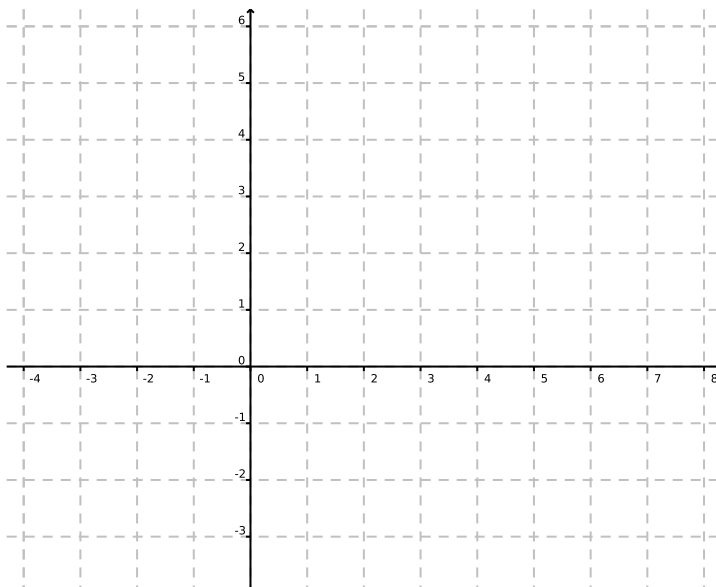
26. Solve the triangle ABC with $A = 40^\circ$, $B = 55^\circ$, and $a = 20$ meters. Round side lengths to the nearest tenth.

27. Let $z = 1 + \sqrt{3}i$
- Convert z to polar form.

- Find z^{12} in polar form.

- Convert z^{12} to rectangular form.

28. Sketch the graph of the parabola with vertex $(1, 0)$ and directrix $y = -2$. Write the equation.



29. Complete the square to put the equation into standard form. Then specify the type of conic section and the coordinates of the center, vertices and foci.

$$4x^2 - 9y^2 - 32x - 36y - 8 = 0$$

30. Given the arithmetic sequence $7 + 12 + 17 + \cdots + 737$

(i) How many terms n are in the sequence?

(ii) Find the sum of the sequence using a formula for the sum of an arithmetic sequence.

BONUS: Work one of the following for 10 bonus points:

(i) Find the partial fraction decomposition of the expression $\frac{-2x + 35}{x^2 + x - 20}$.

(ii) Determine whether or not $\frac{\sin x}{1 - \cos x} + \frac{\sin x}{1 + \cos x} = 2 \csc x$

(iii) Solve the triangle and find the area given $a = 3$ meters, $b = 9$ meters, and $c = 7$ meters. Round each answer to the nearest tenth.

(iv) Find the three cube roots of $2 + 2i$

(v) Evaluate $\sum_{n=1}^{\infty} 4 \left(\frac{3}{5}\right)^{n-1}$