

Students are expected to abide by the University's Student Code of Conduct. The only aids that can be consulted when completing this final exam are the materials posted on Canvas and the required textbook. Any other resources are considered "unauthorized" and cannot be used. Answers that look "processed" will receive no credit.

To receive full credit you must show all your work and simplify all answers completely. Be sure to check your final answers for errors. Problems involving units must have the units represented on the answer to receive full credit. Any question asking for an exact answer will be marked wrong and receive no credit if there are decimal approximations in any step in the problem. Specific formulas are to be used in each of the problems. Any other attempt to work these problems without use of these formulas from the sections we have covered or correct deviations of those formulas will not receive any credit. DO NOT USE MATERIAL AND RESOURCES THAT ARE OUTSIDE THE SECTIONS COVERED.

1. After putting the equation into one of the two forms for the parabola, **find** the focus and directrix of that parabola. **Show all work.**

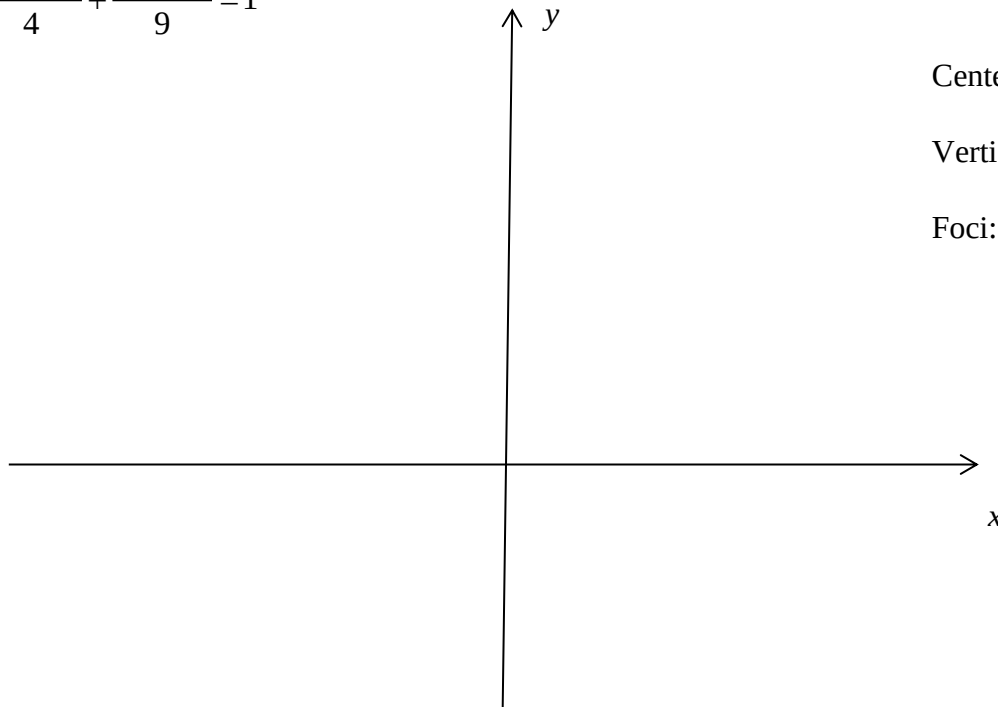
$$x^2 + 6x - 12y + 33 = 0 \quad (4)$$

Focus: _____

Directrix: _____

2. **Find** the center, vertices, and foci of the ellipse. **Sketch** the **graph** showing the foci on the graph. (4)

$$\frac{(x+2)^2}{4} + \frac{(y-3)^2}{9} = 1$$



Center: _____

Vertices: _____

Foci: _____

3. **Find** the equation for the hyperbola with center $C(0,0)$, foci $F(0,\pm 9)$, and vertices $V(0,\pm 7)$.
Show all work.

_____ (4)

4. **Find** the solutions to the system of equations. **Show all work.**

$$\begin{cases} x^2 + 4y^2 = 20 \\ x + 2y = 6 \end{cases}$$

_____ (4)

5. a) **Calculate** the **exact length of arc** that subtends a central angle of measure $\theta = 40^\circ$ on a circle of radius 27 in. (Leave your answer as an exact value in terms of π .) **Show the formula used show all work.**

5a) _____ (4)

- b) **Find** the **area of the sector** determined by θ in part (a). **Show the formula used and all work.**
(Leave your answer as an exact value in terms of π .)

5b) _____ (4)

6. Use the fundamental identities to write $\tan \theta$ in terms of $\sin \theta$ for an acute angle θ . Show all steps.

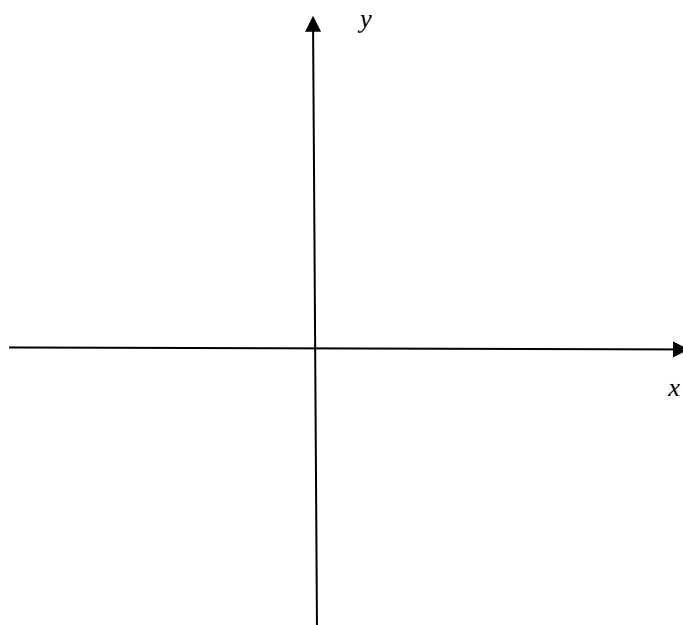
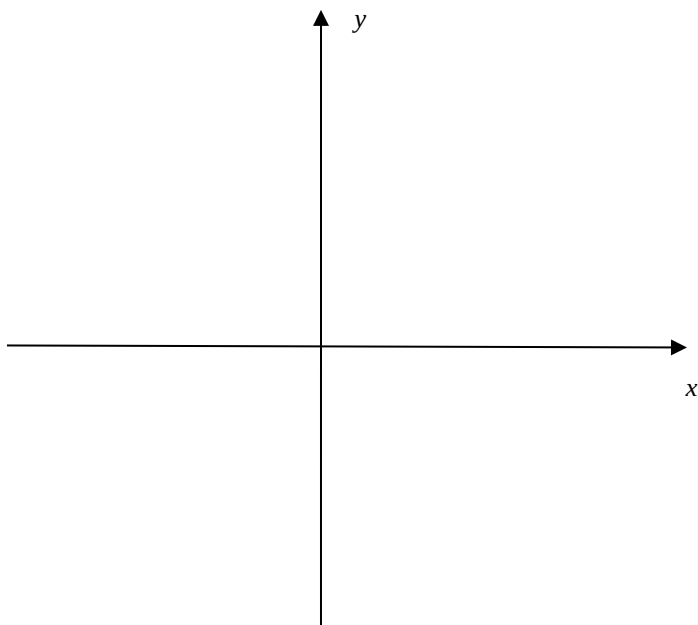
_____ (4)

7. Find the exact value of $\cos \theta$ and $\cot \theta$ given $\csc \theta = \frac{9}{7}$ and $\tan \theta < 0$. Show all work.

$\cos \theta =$ _____ (2)

$\cot \theta =$ _____ (2)

8. Use dashed lines for any vertical asymptotes in the graph(s). Graph at least one cycle with each graph.
 a) Graph $y = \tan x$. (2) b) Graph $y = \sec x$. (2)

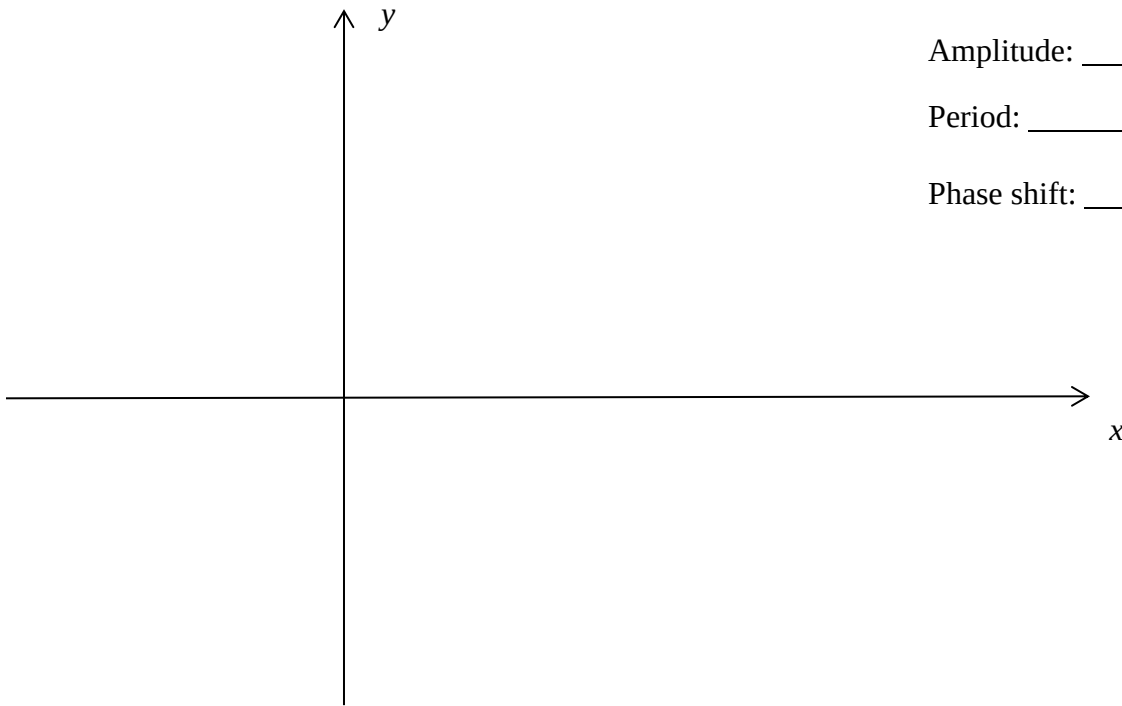


9. **Approximate**, to the nearest 0.01 radians, **all** angles θ in the interval $[0, 2\pi)$ that satisfy $\sec \theta = -2.638$. **Show all your work.**

_____ (4)

10. **Find** the amplitude, period, phase shift, and **graph** at least one complete cycle for $y = 3\sin\left(\frac{1}{2}x + \frac{\pi}{4}\right)$.

(4)



Amplitude: _____

Period: _____

Phase shift: _____

11. **Tree height** A giant redwood tree casts a shadow 510 feet long. **Find** the height of the tree if the angle of elevation of the sun is 25° . **Approximate** your answer in feet to 2 decimal places. **Show all work.**

_____ (4)

12. **Verify the identity** by transforming the left side of the equation into the right side. **Show all your steps.**
 $\csc \theta - \sin \theta = \cot \theta \cos \theta$ (4)

13. **Find the exact radian solutions** for all θ which are solutions of the equation. **Show all work.**
 $\sqrt{3} + 2\cos 3\theta = 0$

_____ (4)

14. **Use the quadratic formula** to solve for the solutions of the equation in the interval $[0^\circ, 360^\circ)$.
Approximate the solutions to the nearest 0.1° . **Show all work.**
 $\cos^2 x - 3\cos x - 1 = 0$

_____ (4)

15. If $\sin \alpha = \frac{8}{17}$ and $\cos \beta = -\frac{5}{13}$ for a second-quadrant angle α and a third-quadrant angle β , **find** the **exact value** for $\sin(\alpha + \beta)$. **Show all work.**

_____ (4)

16. **Find** the **exact radian solutions** of the equation in the interval $[0, 2\pi)$. **Show all work.**
 $\cos 2q = 5 \cos q - 3$

_____ (4)

17. Without using your calculator and using the appropriate multi-angle formula, find the **exact value** of the expression. **Show all work.**

$$\sin \left[2 \cos^{-1} \left(-\frac{2}{5} \right) \right]$$

_____ (4)

18. **Approximate** to two decimal places the length of **side b** of the triangle ABC given: **Show all work.**

$$\alpha = 11^\circ, \gamma = 62^\circ, a = 25.1$$

_____ (4)

19. ***Dimensions of a triangular plot*** The angle at one corner of a triangular plot of ground is 96° , and the sides that meet at this corner are 58 and 82 feet long. Approximate to the nearest foot the length of the third side. **Show all work.**

_____ (4)

20. **Approximate** to the nearest square foot the **area** of triangle ABC . **Show all work.**

$$a = 17 \text{ feet}, b = 19 \text{ feet}, c = 26 \text{ feet}$$

_____ (4)

BONUS: Consider the three equations of $x + y + z = 1$ and $y - x = 0$ and $y + z = -1$. Place them into a system of equations and then solve that system. **Show all work.**