1. Find the vertex, focus, and directrix of the parabola.
\[ y = x^2 - 4x + 2 \]

2. Find an equation of the ellipse that has its center at the origin with horizontal major axis of length 8, minor axis of length 5.

3. Find the center, vertices, the foci, and the equations of the asymptotes of the hyperbola. Sketch its graph.
\[ \frac{(y + 2)^2}{9} - \frac{(x + 2)^2}{4} = 1 \]
4. Solve the system. 
\[
\begin{align*}
2y^2 - 4x^2 &= 4 \\
9y^2 + 16x^2 &= 140
\end{align*}
\] 
(9.1 #25)

5. **Mixing a silver alloy** A silversmith has two alloys, one containing 35% silver and the other 60% silver. How much of each should be melted and combined to obtain 100 grams of an alloy containing 50% silver? 
(9.2 #31)

6. a) Find the radian and degree measures of the central angle \( \theta \) subtended by an arc of 7 cm on a circle of radius 4 cm. 
(6.1 #33)

b) Find the area of the sector determined by \( \theta \) in part (a). 

6a) ______________________  
(4)

6b) ______________________  
(4)
7. A wheel of radius 5 inches is rotating at a rate of 40 rpm. (6.1 #45)
   a) Find the angular speed (in radians per minute).

   \[ \text{7a) } \underline{\text{______________}} \hspace{1cm} (4) \]

   b) Find the linear speed of a point on the circumference (in ft/min).

   \[ \text{7b) } \underline{\text{______________}} \hspace{1cm} (4) \]

8. Find the exact values of \( \sin \theta \), \( \cos \theta \) and \( \tan \theta \) for the acute angle \( \theta \) if \( \sec \theta = \frac{6}{5} \). (6.2 #21)

   \[ \text{8. } \underline{\text{______________}} \hspace{1cm} (4) \]

9. Find the exact value. (6.4 #18)

   \( \csc(-2\pi/3) \)

   \[ \text{9. } \underline{\text{______________}} \hspace{1cm} (4) \]

10. Graph at least one complete period of \( y = 1 + \csc x \). (6.3 #62)

   \[ \text{10. } \underline{\text{______________}} \hspace{1cm} (4) \]

   \[ \begin{align*}
   & \left\{ \begin{array}{l}
   x & \text{for } x \in \mathbb{R} \\
   y & \text{for } y \in \mathbb{R}
   \end{array} \right. \\
   & \text{Graph of } y = 1 + \csc x.
   \end{align*} \]
11. Find the amplitude, period, phase shift, and graph at least one complete period for \( y = -5 \cos \left( \frac{1}{3} x + \frac{\pi}{6} \right) \).

\[ y = -5 \cos \left( \frac{1}{3} x + \frac{\pi}{6} \right) \]

12. Given the indicated parts of triangle \( ABC \) with \( \gamma = 90^\circ \), express the third part in terms of the first two.

\[ \beta, b; \ a \]

13. A rocket is fired at sea level and climbs at a constant angle of \( 75^\circ \) through a distance of 10,000 feet. Approximate its altitude to the nearest foot.

\[ \tan^4 k - \sec^4 k = 1 - 2 \sec^2 k \]
15. Find the exact values of the solutions of the equation that are in the interval \([0, 2\pi]\).

\[2 \sin^2 u = 1 - \sin u\]

(7.2 #43)

15. ________________ (4)

16. If \(\cos \alpha = -\frac{2}{5}\) and \(\cos \beta = -\frac{3}{5}\) for third-quadrant angles \(\alpha\) and \(\beta\), find the exact value for:

(a) \(\sin(\alpha - \beta)\)

(7.3 #23)

16a) ________________ (4)

(b) \(\cos(\alpha - \beta)\)

16b) ________________ (4)

17. Given \(\sec \theta = -3; 90^\circ < \theta < 180^\circ\) find the exact value of \(\sin 2\theta\), \(\cos 2\theta\) and \(\tan 2\theta\).

(7.4 #3)

17a) \(\sin 2\theta\): ________________ (4)

17b) \(\cos 2\theta\): ________________ (4)

17c) \(\tan 2\theta\): ________________ (4)
18. Find the **exact values** of the solutions of the equation that are in the interval \([0, 2\pi)\).  
\[
\sin 2t + \sin t = 0
\]

19. Without using your calculator, find the **exact value** of the expression. 
\[
csc\left[\cos^{-1}\left(-\frac{1}{4}\right)\right]
\]

20. Use inverse trigonometric functions to find the solutions of 
\[
2\tan^2 t + 9\tan t + 3 = 0 
\]
that are in \(\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)\), and approximate the solutions to four decimal places.
21. In triangle $ABC$ if $\alpha = 42^\circ10'$, $\gamma = 61^\circ20'$ and $b = 19.7$ find the value of side $a$. (8.1 #5)

21. ________________ (4)

22. A triangular plot of land has sides of lengths 420 feet, 350 feet, and 180 feet. Approximate the smallest angle between the sides. (8.2 #18)

22. ________________ (4)

23. Approximate the area of a parallelogram that has sides of lengths $a$ and $b$ (in feet) if one angle at a vertex has measure $\theta$.
   
   $a = 12.0\text{ ft}, \ b = 16.0\text{ ft}, \ \theta = 40^\circ$ (8.2 #43)

23. ________________ (4)

**Bonus:** Find all exact values for the solutions of the equation. (7.2 #17)

$$\sin\left(2x - \frac{\pi}{3}\right) = \frac{1}{2}$$

**Bonus:** ________________ (4)