1. Simplify.  
\[ \left( \frac{x^6 y^3}{x^4 y^2} \right)^{-1/3} \]

\[ \left( \frac{x^2}{y} \right)^{-1/2} \]

1. ________________ (4)

2. **Preparing a glucose solution** In a certain medical test designed to measure carbohydrate tolerance, an adult drinks 7 ounces of a 30% glucose solution. When the test is administered to a child, the glucose concentration must be decreased to 20%. How much 30% glucose solution and how much water should be used to prepare 7 ounces of 20% glucose solution?  

2. ________________ (4)

3. Solve for the specified variable.  
\[ A = 2\pi r(r + h) \] for \( r \)

3. ________________ (4)

4. Solve the equation.  
\[ 2x^{-2/3} - 7x^{-1/3} - 15 = 0 \]

4. ________________ (4)
5. Solve the inequality. Express the solution in interval notation.  

\[ x^3 + 2x^2 - 4x - 8 \geq 0 \]  

5. \underline{\text{_____________________}} \quad (4) 

6. Find an equation of the circle with center \( C(-4, 6) \) and passing through the point \( P(1, 2) \).  

6. \underline{\text{_____________________}} \quad (4) 

7. Given the points \( A(3, -1) \) and \( B(-2, 6) \). Find an equation (in slope-intercept form) for the perpendicular bisector of segment \( AB \).  

7. \underline{\text{_____________________}} \quad (4) 

8. Find the domain of \( f(x) = \frac{\sqrt{2x - 3}}{x^2 - 5x + 4} \).  

8. \underline{\text{_____________________}} \quad (4)
9. Given \( f(x) = -2x^2 + 20x - 43 \).  

   a) Use the quadratic formula to find the zeros of \( f(x) \).

   \[ 9a) \text{___________________________} \] (2)

   b) Find the maximum or minimum value of \( f(x) \).

   \[ 9b) \text{___________________________} \] (2)

   c) Sketch the graph of \( f(x) \).

   \[ \text{(2)} \]

10. Find the quotient and the remainder if \( f(x) = 3x^3 + 2x - 4 \) is divided \( p(x) = 2x^2 + 1 \).  

   \[ 10. \text{___________________________} \] (4)
11. Given the one-to-one function $f(x) = \sqrt[3]{x} + 1$, find the inverse function, $f^{-1}(x)$.  

12. **Compound interest** If $1000 is invested at a rate of 7% per year compounded monthly, find the balance after 6 months. 

13. If $1000 is deposited in a savings account that pays interest at a rate of 8.25% per year compounded continuously, find the balance after 5 years. 

14. Find the **exact value** for the solution of the equation. 

\[
\log (x^2 + 4) - \log (x + 2) = 2 + \log (x - 2)
\]
15. Find the foci of the hyperbola. Sketch its graph showing the center, vertices and foci.

\[ 4y^2 - x^2 + 40y - 4x + 60 = 0 \]

16. **Planning production**  A small furniture company manufactures sofas and recliners. Each sofa requires 8 hours of labor and $180 in materials, while a recliner can be built for $105 in 6 hours. The company has 340 hours of labor available each week and can afford to buy $6750 worth of materials. How many recliners and sofas can be produced if all labor hours and all materials must be used?

17. Find the **exact value** of \( \csc \theta \) if \( \theta \) is in standard position and \( P(-2,-5) \) is on the terminal side of \( \theta \).
18. Graph at least one complete period of \( y = 1 + \tan x \). \hspace{1cm} (6.3 #59)

19. Verify the identity. **Show all work.** \hspace{1cm} (7.1 #11)

\[
(\sec u - \tan u)(\csc u + 1) = \cot u
\]

20. Find the **exact values** for the solutions of the equation that are in the interval \([0, 2\pi]\). \hspace{1cm} (7.2 #43)

\[2\sin^2 u = 1 - \sin u\]
21. Given $\sec \theta = -3; \ 90^\circ < \theta < 180^\circ$ find the exact value of $\sin 2\theta$, $\cos 2\theta$, and $\tan 2\theta$ \hfill (7.4 #3)

21a) $\sin 2\theta : \quad$ \hfill (4)

21b) $\cos 2\theta : \quad$ \hfill (4)

21c) $\tan 2\theta : \quad$ \hfill (4)

22. In triangle $ABC$ if $\alpha = 42^\circ 10', \ \gamma = 61^\circ 20'$ and $b = 19.7$ find the value of side $a$. \hfill (8.1 #5)

22. \hfill (4)

23. Use Heron's formula to approximate the area of triangle $ABC$.

\[ a = 25.0 \text{ ft}, \quad b = 80.0 \text{ ft}, \quad c = 60.0 \text{ ft} \] \hfill (8.2 #39)

23. \hfill (4)

**Bonus:** Airplane takeoff

An airplane takes off at a $10^\circ$ angle and travels at the rate of 250 ft/sec.

Approximately how long does it take the airplane to reach an altitude of 15,000 feet? \hfill (6.7 #32)

**Bonus:** \hfill (4)