MIXED REVIEW

Chapters 1–13

1. Find a rectangular equation and a pair of parametric equations for the line through points (5, 6) and (1, 8).

2. If $-\frac{\pi}{2} < \alpha < 0$, $\cos \alpha = \frac{35}{37}$, and $\beta = 210°$, find $\csc \alpha$, $\sin(\alpha - \beta)$, $\cos 2\alpha$, and $\sin \frac{\alpha}{2}$.

Evaluate each expression.

3. $\frac{1}{2}\log_8 4 + 4\log_8 \frac{1}{2}$

4. $\sin\left(\text{Cos}^{-1}\left(-\frac{1}{3}\right)\right)$

5. $(1 - i)^{18}$

6. $9 - \frac{9}{2} + \frac{9}{4} - \frac{9}{8} + \ldots$

7. $10^{2 - \log 8}$

8. $\sum_{k=1}^{100} \cos \frac{k\pi}{4}$

9. Show that $\tan(\pi + \theta) = \tan \theta$ and explain what this shows about $\tan \theta$.

10. A financial report on an airport shuttle bus projects that the daily revenue collected will vary according to the fare charged, as shown by the table below. Predict the maximum possible daily revenue.

Fare	\$10	\$11	\$12
Daily Revenue	\$3000	\$3135	\$3240

Solve each system.

11. $9x - 5y = 18$
$5x - 3y = 15$

12. $5x - y = 10$
$y = x^2 - 7x + 10$

13. $16x^2 - y^2 = 64$
$4x^2 + 4y^2 = 169$

14. A rectangle has sides of lengths 12 cm and 5 cm. Find the measures of the angles formed by the diagonals.

15. Find all four roots of $4x^4 + 16x^3 + 23x^2 - 4x - 6 = 0$.

Solve for x.

16. $4x^3 + 4x^2 > 9x + 9$

17. $8x^{-1.5} = 125$

18. $5^x = 100$

19. Let $f(x) = x^2$ and $g(x) = \frac{1}{2}x - 6$. Find $f(g(x))$ and $g(f(x))$.

20. Solve $\sin 2\theta = \cos^2 \theta$ for $0° \leq \theta < 360°$.

21. Find the sum of (**a**) the first 20 terms and (**b**) the first n terms of the series $2 + 6 + 10 + 14 + 18 + \ldots$.

22. In $\triangle XYZ$, $\angle X = 50°$, $\angle Y = 105°$, and $x = 30$. Find z and the area of $\triangle XYZ$.

23. If $\mathbf{u} = (6, -8, -24)$ and $\mathbf{v} = (2, -1, 2)$, find $\mathbf{u} \cdot \mathbf{v}$, $\mathbf{u} \times \mathbf{v}$, and the angle between $\mathbf{u}$ and $\mathbf{v}$.

24. Describe the symmetries of the graph of the equation $x^2 + 4xy + y^2 = 4$. Then tell whether the graph is a circle, a parabola, or a hyperbola.

25. Simplify $\frac{1}{1 + \tan^2 x} + \frac{1}{1 + \cot^2 x}$.

26. Use mathematical induction to prove your answer to part (b) of Exercise 21.