

Students reading **Calculus** should be very comfortable with algebra (including complex numbers and logarithms), geometry (including analytic geometry), and trigonometry. In particular, **students who do not have a solid algebra background should consider our *Intermediate Algebra* book rather than *Calculus*.**

Students reading this book should be able to solve all of the following problems—**without using a calculator**—with little or no difficulty.

Algebra

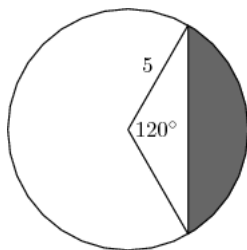
1. Expand $(x + 2y)^3$.
2. Find the sum and the product of the roots (real and complex) of $x^3 + 3x^2 + 7x - 11 = 0$.
3. Solve for x :

$$\frac{3}{x-2} + \frac{2}{x+2} = \frac{5}{x^2-4}.$$

4. If Richard can paint their living room in 4 hours, and Vanessa can paint the same living room in 5 hours, then how long will it take them to paint the living room working together?
5. Determine the sum of the infinite geometric series with first term 3 and common ratio $\frac{2}{5}$.
6. Compute $\log_9 27$.
7. Factor completely $x^6 - 1$ over the real numbers.

Geometry and Analytic Geometry

8. Find the area of the shaded region below (lying inside a circle of radius 5):



9. Find the equation of the line passing through the points $(2, 3)$ and $(5, -1)$.



Art of Problem Solving Textbooks
Are You Ready For
Calculus

10. Find the area of the region bordered by the lines $4x + 7y = 14$, $x = 1$, and $y = -2$.
11. Sketch the graph of the equation

$$x^2 + y^2 + 2x + 4y = 11.$$

Trigonometry

12. Evaluate the following quantities:

(a) $\sin\left(\frac{\pi}{6}\right)$

(b) $\cos\left(\frac{\pi}{2}\right)$

(c) $\tan\left(\frac{5\pi}{4}\right)$

13. Find all θ with $0 \leq \theta \leq 2\pi$ such that:

$$(\sin \theta + \cos \theta)^2 = \frac{3}{2}.$$

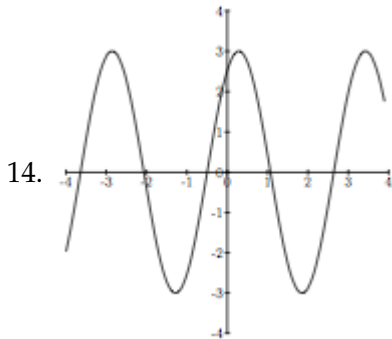
14. Sketch the graph of $y = 3 \sin(2x + 1)$.

15. Simplify $\left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12}\right)^9$.

Don't look at the next page until you've attempted all the problems!

The answers to Are You Ready for Calculus are below.

1. $x^3 + 6x^2y + 12xy^2 + 8y^3$
2. Sum: -3 , Product: 11
3. $x = \frac{3}{5}$
4. $\frac{20}{9}$ hours
5. 5
6. $\frac{3}{2}$
7. $(x - 1)(x + 1)(x^2 + x + 1)(x^2 - x + 1)$
8. $\frac{25}{3}\pi - \frac{25\sqrt{3}}{4}$
9. $(y - 3) = -\frac{4}{3}(x - 2)$ or $y = -\frac{4}{3}x + \frac{17}{3}$ or $4x + 3y = 17$ or equivalent
10. $\frac{72}{7}$
11. Circle with center $(-1, -2)$ and radius 4
12. (a) $\frac{1}{2}$ (b) 0 (c) 1
13. $\theta \in \left\{ \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12} \right\}$



14. The key features are passing through $(-\frac{1}{2}, 0)$, crossing the x -axis at periods of every $\pi/2$, and having an amplitude (height) of 3 .

15. $-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$