

#7: Algebra/Geometry Review

October 17, 2008

This week we'll spend some time reviewing some material from algebra and geometry. Of course, it would be impossible—not to mention silly—to review *everything* you learned in algebra and geometry. It would take far too long, and some of it is not all that important anyway. Instead, we'll just review some of the pieces that will be an important foundation throughout the rest of the year.

The format is simple—there are a number of problems, each of which you should (theoretically) know how to solve. It's fine if you don't remember how to solve some of them—that's the point of a review, after all—but you're responsible for refreshing your memory on the things you've forgotten. In order to refresh your memory, you are welcome to ask me for help, read an old textbook, consult Wikipedia, send a letter to Santa Claus, or whatever you like.

All answers must be exact. For example, write $\sqrt{17}$ instead of $4.123\dots$, or 3π instead of $9.425\dots$. Show your work. The `align*` environment may be useful. For example, if asked to solve the equation $3x + 4x = 9 + 5$, you could write

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\begin{align*}
  3x + 4x &= 9 + 5 \\
  7x &= 14 \\
  x &= 2
\end{align*}
```

which would produce output like this:

$$\begin{aligned} 3x + 4x &= 9 + 5 \\ 7x &= 14 \\ x &= 2 \end{aligned}$$

Do not just write " $x = z$ "; you must show the steps you used to obtain that solution for x .

Problems 1–8. Solve each equation for x .

1. $4x - 13 = 31$
2. $\sqrt{x + 3} = 7$
3. $x^{-5} = 2$
4. $x + \frac{2}{x} = -3$
5. $17x - x(4 + x) = 29$
6. $\frac{x}{3} + \frac{4x}{7} = \frac{3}{12}$
7. $x^{2/3} = 25$
8. $\frac{3/7}{x/14} = \frac{8}{4/3}$

For **problems 9–16**, follow the instructions given.

9. Expand:
 - (a) $(x + 2)(3x - 1)$
 - (b) $(y + 5)^3$
 - (c) $(z^3 + 2z + 1)(z + 6)$
10. Factor:
 - (a) $x^2 - 2x - 8$
 - (b) $9h^2 - 16$
11. Let $f(x) = x^2 - 3$. Evaluate:
 - (a) $f(5)$
 - (b) $f(f(0))$
 - (c) $f(y + 2)$
12. Solve for y : $-3y - 5 \leq (y + 1)^2$.
13. Solve for x and y :

$$\begin{aligned}2x + 3y &= 9 \\5x - y &= 3 + x\end{aligned}$$

14. A right triangle has a hypotenuse of length 20 and a leg of length 12. What is the length of the other leg?
15. What is the area of a square whose diagonal has length 7?
16. A cylindrical container full of whipped cream has circumference 12π inches. When spread evenly on a basketball court with a depth of $\frac{1}{4}$ inch, the whipped cream covers 63 square feet. How tall was the container?