

1.1 Modeling & Equation Solving

Review Target: Find extrema, zeroes, in odd or even functions

Review of Prior Concepts

Quick Review p.75

1.

$$x^2 - 16$$

$$(x - 4)(x + 4)$$

3.

$$81y^2 - 4$$

$$(9y - 2)(9y + 2)$$

4.

$$3x^3 - 15x^2 + 18x$$

$$3x(x^2 - 5x + 6)$$

$$3x(x - 3)(x - 2)$$

7.

$$x^2 + 3x - 4$$

$$(x - 1)(x + 4)$$

More Practice**Difference of Squares**

<https://www.khanacademy.org/math/algebra-basics/quadratics-polynomials-topic/factoring-special-products-core-algebra/v/factoring-difference-of-squares>

<http://www.regentsprep.org/regents/math/algebra/av6/Lfactps.htm>

Factoring Quadratic Expressions

<http://www.purplemath.com/modules/factquad.htm>

<http://www.mathguide.com/lessons/Factoring.html>

SAT Connection**Passport to Advanced Math**

3. Create an equivalent form of an algebraic expression.

4. Solve a system of one linear equation and one quadratic equation.

Example: If $(ax + 2)(bx + 7) = 15x^2 + cx + 14$ for all values of x , and $a + b = 8$, what are the two possible values for c ?

- A) 3 and 5
- B) 6 and 35
- C) 10 and 21
- D) 31 and 41

Solution

Unit 1 (Chapter 1): Functions

Solve equations algebraically and graphically

Example 1: $x^2 + 2x = 2x + 16$

Algebraically

$$\underline{ex:} \quad x^2 + 2x = 2x + 16$$

$$\quad \quad \quad \underline{-2x - 16} \quad \underline{-2x - 16}$$

$$x^2 - 16 = 0 \quad \text{OR}$$

$$(x-4)(x+4) = 0$$

$$x-4=0 \quad x+4=0$$

$$\boxed{x=4} \quad \boxed{x=-4}$$

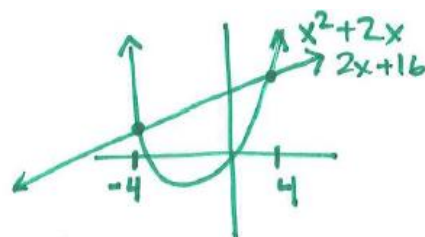
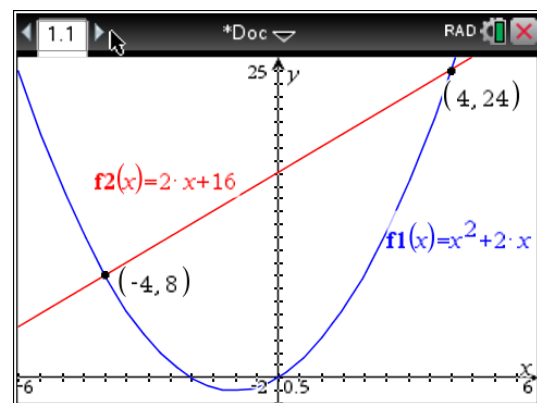
** get one side = to zero*
** factor*
** set each factor = to zero*

$$x^2 - 16 = 0$$

$$\sqrt{x^2} = \sqrt{16}$$

$$x = \pm 4$$

Graphically



Example 2: $3x^2 - 4x - 1 = (x + 2)(x - 3) + 8x$

Algebraically

$$\underline{ex:} \quad 3x^2 - 4x - 1 = (x+2)(x-3) + 8x$$

$$3x^2 - 4x - 1 = x^2 + 2x - 3x - 6 + 8x$$

$$3x^2 - 4x - 1 = x^2 + 7x - 6$$

$$\underline{-x^2 - 7x + 6} \quad \underline{-x^2 - 7x + 6}$$

$$2x^2 - 11x + 5 = 0$$

** factor by grouping ("British Method")*

$$2x^2 - 10x + 1x + 5 = 0$$

$$2x(x-5) - 1(x-5) = 0$$

$$(x-5)(2x-1) = 0$$

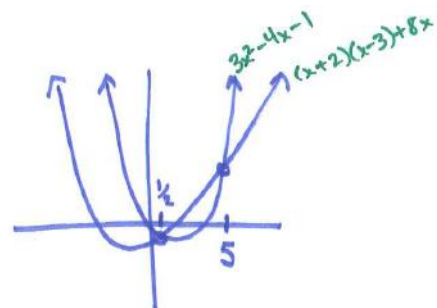
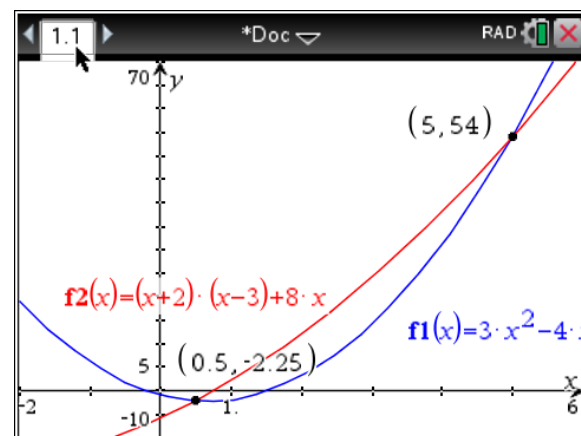
$$x-5=0 \quad 2x-1=0$$

$$\boxed{x=5} \quad \boxed{x=\frac{1}{2}}$$

$$2 \cdot 5 = 10$$

$$\begin{matrix} \wedge \\ 2, 5 \\ 10, 1 \\ \hline -10, -1 \end{matrix}$$

Graphically



Example 3: $x - 3 = 3\sqrt{2x + 1}$

Algebraically

$$x - 3 = 3\sqrt{2x + 1}$$

ex: $(x - 3)^2 = (3\sqrt{2x + 1})^2$ * Square both sides

$$(x - 3)(x - 3) = 3^2(\sqrt{2x + 1})^2$$

$$x^2 - 6x + 9 = 9(2x + 1)$$

$$x^2 - 6x + 9 = 18x + 9$$

$$\underline{-18x - 9} \quad \underline{-18x - 9}$$

$$x^2 - 24x = 0$$

* factor

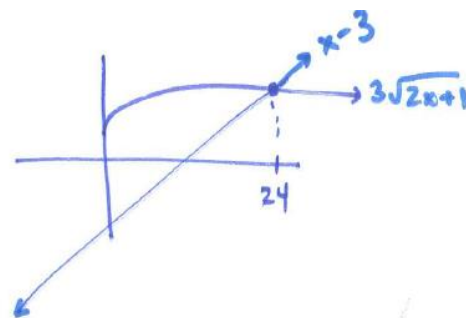
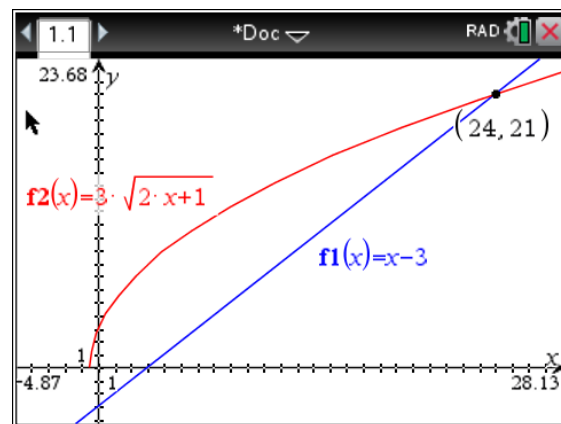
$$x(x - 24) = 0$$

* set each factor equal to zero

$$x = 0 \quad x - 24 = 0$$

extraneous solution x = 24

Graphically



More Practice

Solving Equations Algebraically

<http://www.sosmath.com/algebra/solve/solve0/solve0.html>

<http://dl.uncw.edu/digilib/mathematics/algebra/mat111hb/izs/asolve/asolve.html>

<https://www.youtube.com/watch?v=QNa-m3XHOQ8>

Solving Equations Graphically

<http://mathbits.com/MathBits/TINSection/Algebra1/SolvingEquations.html>

<https://www.youtube.com/watch?v=Xrhx4YJQGXk>

<https://www.youtube.com/watch?v=mZyxGwKJXmw>

Homework Assignment

p.78 #29,30,31,33,34,37

SAT Connection**Solution**

Choice D is correct. One can find the possible values of a and b in $(ax + 2)(bx + 7)$ by using the given equation $a + b = 8$ and finding another equation that relates the variables a and b . Since $(ax + 2)(bx + 7) = 15x^2 + cx + 14$, one can expand the left side of the equation to obtain $abx^2 + 7ax + 2bx + 14 = 15x^2 + cx + 14$. Since ab is the coefficient of x^2 on the left side of the equation and 15 is the coefficient of x^2 on the right side of the equation, it must be true that $ab = 15$. Since $a + b = 8$, it follows that $b = 8 - a$. Thus, $ab = 15$ can be rewritten as $a(8 - a) = 15$, which in turn can be rewritten as $a^2 - 8a + 15 = 0$. Factoring gives $(a - 3)(a - 5) = 0$. Thus, either $a = 3$ and $b = 5$, or $a = 5$ and $b = 3$. If $a = 3$ and $b = 5$, then $(ax + 2)(bx + 7) = (3x + 2)(5x + 7) = 15x^2 + 31x + 14$. Thus, one of the possible values of c is 31. If $a = 5$ and $b = 3$, then $(ax + 2)(bx + 7) = (5x + 2)(3x + 7) = 15x^2 + 41x + 14$. Thus, another possible value for c is 41. Therefore, the two possible values for c are 31 and 41.

Choice A is incorrect; the numbers 3 and 5 are possible values for a and b , but not possible values for c . Choice B is incorrect; if $a = 5$ and $b = 3$, then 6 and 35 are the coefficients of x when the expression $(5x + 2)(3x + 7)$ is expanded as $15x^2 + 35x + 6x + 14$. However, when the coefficients of x are 6 and 35, the value of c is 41 and not 6 and 35. Choice C is incorrect; if $a = 3$ and $b = 5$, then 10 and 21 are the coefficients of x when the expression $(3x + 2)(5x + 7)$ is expanded as $15x^2 + 21x + 10x + 14$. However, when the coefficients of x are 10 and 21, the value of c is 31 and not 10 and 21.