1.1 Modeling & Equation Solving

Target 1A: 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

Solve equations algebraically and graphically

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

Algebraically

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

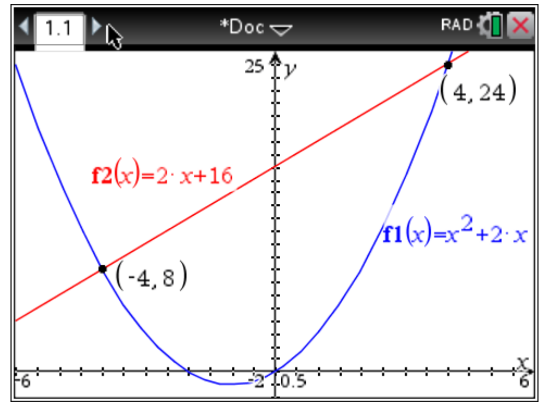
*get one side = to zero: $x^2 - 16 = 0$ — OR → $x^2 - 16 = 0$, $\sqrt{x^2} = \sqrt{16}$, $x = \pm 4$

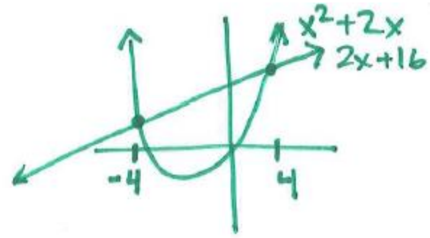
*factor: $(x-4)(x+4) = 0$

*set each factor = to zero: $x - 4 = 0 \qquad x + 4 = 0$

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

Graphically





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

Algebraically

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

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

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

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

$2 \cdot 5 = 10$
$2, 5$
$10, 1$
$-10, -1$ ✓

*Factor by grouping ("British Method"): $2x^2 - 10x - 1x + 5 = 0$

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

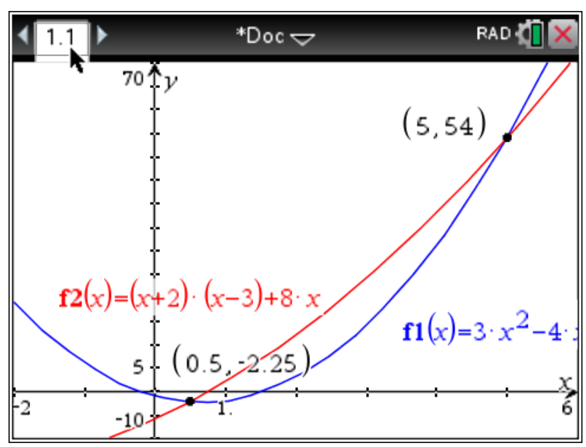
$(x-5)(2x-1) = 0$

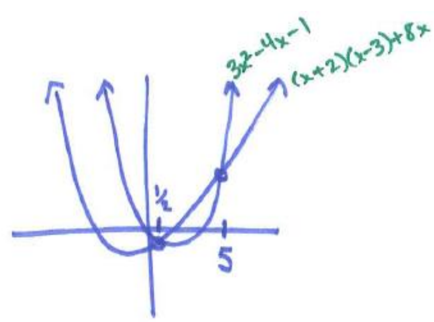
$x - 5 = 0 \qquad 2x - 1 = 0$

$x = 5 \qquad 2x = 1$

$x = \frac{1}{2}$

Graphically





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

Algebraically

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

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

$(x-3)(x-3) \qquad 3^2\left(\sqrt{2x+1}\right)^2$

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

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

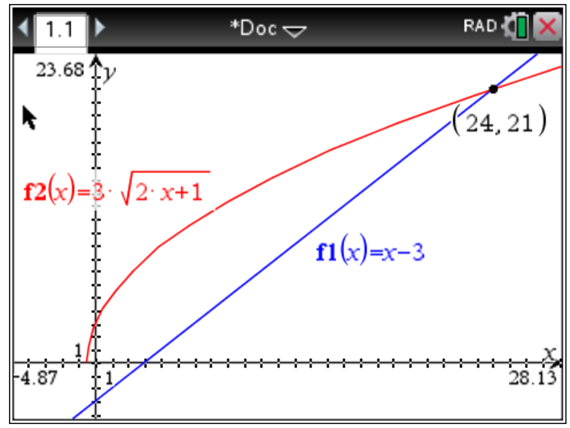
$x^2 - 24x = 0$ * factor

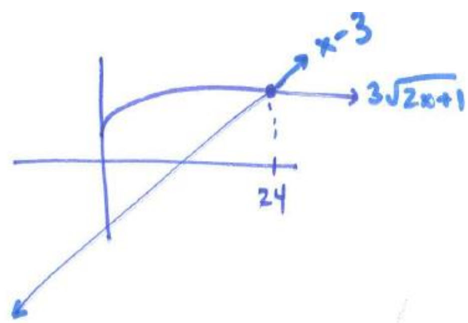
$x(x-24) = 0$ * set each factor equal to zero

$x = 0 \qquad x - 24 = 0$

extraneous solution $\boxed{x = 24}$

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.