Week 3, Day 2

What is a polynomial? It is an expression that has the leading coefficient with an exponent value greater than 1.

Meaning – Ax2 + Bx + C, or $Ax^3 + Bx^2 + Cx + D$
$Ax^3 + Bx^2 + Cx + D$ – You can call this a cubic function, trinomial or polynomial. Trinomial because the leading coefficient has an exponent value of 3.

Yes, such a lengthy expression like that can exist. It just means it's a different kind of line with its own practical application. You in fact already had a homework assignment that contains this example. If you recall –

$$ax^3 + bx^2 + cx + d = 0$$

In the equation above, a, b, c, and d are constants. If the equation has roots -1, -3, and 5, which of the following is a factor of $ax^3 + bx^2 + cx + d$?

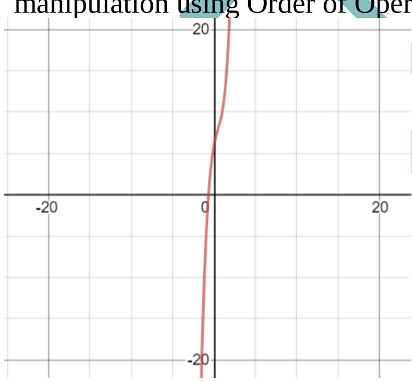
A. x - 1
B. x + 1
C. x - 3
D. x + 5

(x + 1)(x + 3)(x – 5)

Let's give them some values – A. 3 B. -4 C. 5 D. 6 (nothing to do with the original problem)
What does this line look like?

Show on the parabolic grapher. It's not a parabola. $3x^3 – 4x^2 + 5x + 6$

Isolating quantities…a fancy way of saying (solve for a certain variable). I call this basic algebra manipulation using Order of Operations. You should know PEMDAS by now, but just in case I will go



P = Parenthesis
E = Exponent
M = Multiplication (In the rules of Algebra, these orders work in opposites)
D = Division
A = Addition
S = Subtraction

Multiplication and Division are opposites, Addition and Subtraction are opposites, and believe it or not…Exponents have opposites too, they're called square roots. They're not listed on PEMDAS because it's not as commonly used.

How do we identify that such a problem is "isolating quantities or algebra manipulation?"

Look for:

- "Which of the following expresses (this variable) in terms of the other variables?"
- "Which of the following correctly expresses?"

For example –

$V = \pi r^2 h$

"which of the following correctly expresses r?" – rearrange and solve for r

I = Prt

"which of the following correctly expresses P? – rearrange and solve for p

These will seem easy, once you get the hang of it, and they are. Then, they can look super complex and intimidating…for example –

$$m = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^N}{\left(1+\frac{r}{1{,}200}\right)^N - 1}P$$

The formula above gives the monthly payment m needed to pay off a loan of P dollars at r percent annual interest over N months. Which of the following gives P in terms of m, r, and N ?

A) $P = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^N}{\left(1+\frac{r}{1{,}200}\right)^N - 1}m$

B) $P = \frac{\left(1+\frac{r}{1{,}200}\right)^N - 1}{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^N}m$

C) $P = \left(\frac{r}{1{,}200}\right)m$

D) $P = \left(\frac{1{,}200}{r}\right)m$

Let's briefly talk about the ***remainder theorem***. What is that? Maybe once, the SAT will look into setting up a remainder question via a function.

Theorem is – "If f(x) or p(a) = b, then the remainder when p(x) is divided by x – a is b. Classic example –

https://www.youtube.com/watch?v=zM7GZNUgHbo

Q: For a polynomial p(x), the value of P(3) is -2, which of the following must be true about p(x)?

A. X – 5 is a factor of p(x)
B. X – 2 is a factor of p(x)
C. X + 2 is a factor of p(x)
D. The remainder when p(x) is divided by x – 3 is -2

All this means is that you have expressions that are practical and realistic, but does require a certain amount of common sense. For example, any number divided by 0 is undefined. How can you divide something from nothing? That's physically impossible. However, you can divide 0 by a number.

i.e. 7 / 0 = undefined 0 / 7 = 0

Undefined is what you can an irrational expression. Yes, this means crazy, ridiculous or ludicrous. But, it's on the SAT….

If you have an expression that's a polynomial, all it means is that you have something with the $Ax^2 + Bx + C$ format

What is the difference between rational and irrational? Rational means that the math models can physically occur and follow traditional math conventions. Irrational means that the math is setup in such a way where you have to manipulate from irrational to rational. For example, you may have seen i = √-1 in school. You can't physically have a negative number inside a square root. It's physically impossible.

So, we have to do is square it. ***$i^2 = (\sqrt{-1})^2$ which is just -1*** without the square root. You're just taking the square root off, but conventionally a – X - is a positive value. This is why it's not a rational number. Now, -1 is in a usable form.

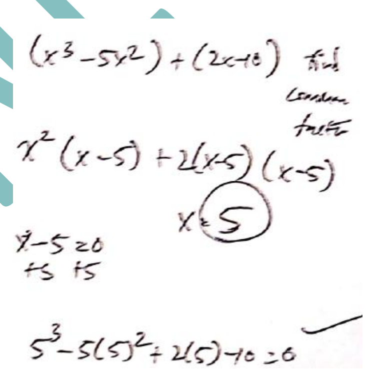
For example –

$$x^3 - 5x^2 + 2x - 10 = 0$$

For what real value of x is the equation above true?

To make things easy, look at the obvious. The entire equation is equal to 0, and there's a 10. 10 – 10 = 0. So, $x^3 - 5x^2 + 2x = 10$. Use 1 – 5 as process of elimination to get

$X^3 - 5x^2 + 2x = -10$



Another way to do it - ***Factor***

$X^3 - 5x^2 + 2x - 10 = 0$ (find common roots)

Any answer you come up, test it with the equation!

Week 3, Day 3

A radical is another way of saying square root. As I mentioned before, radicals / square roots are the opposite of exponents.

$3^2 = 9$	$5^2 = 25$	$9^2 = 81$	$15^2 = 125$
$\sqrt{9} = 3$	$\sqrt{25} = 5$	$\sqrt{81} = 9$	$\sqrt{125} = 15$

These are what you call perfect squares and perfect square roots? Why perfect? Because after the squared and square root operations to the numbers, they don't leave a decimal value or remainder. They are whole numbers. (give more perfect square and square root examples)

A complex number is a number combined with an irrational number – negative square root symbol.

3 + 2i   5 + √-15   7i + 2i   and more

Why do this? To able to stretch your understanding on how math can be manipulated past what you're used to. SAT math is designed for you to be able to connect more than just dots, what is the connection all about? What does it mean? How can it be changed, mutated?

Which of the following complex numbers is equivalent to $\frac{3-5i}{8+2i}$? (Note: $i = \sqrt{-1}$)

A) $\frac{3}{8} - \frac{5i}{2}$

B) $\frac{3}{8} + \frac{5i}{2}$

C) $\frac{7}{34} - \frac{23i}{34}$

D) $\frac{7}{34} + \frac{23i}{34}$

Typical example type of question

The way this works, multiple the bottom by what you call it's conjugate, or opposite. The bottom is 8 + 2i. which means you'll multiple the entire equation with this new format:

(3 – 5i) / (8 + 2i) X (8 - 2i) / (8 – 2i)

Replace your i^2 with -1

Your answer choice will be C

The basic concept of a percent is a part / whole.

Percents can be written as fractions, decimal forms or just with the percent sign. Percentages are important to understand because everything fraction is a percent by nature.

To change from percent to decimal – move decimal to left, change from decimal to percent, move to the right

Let's go over some of the most common percentages, fractions and decimals. It'd behoove you to remember these or be familiar with them.

2 – page homework assignment