

00:00:07.750 --> 00:00:09.208

All right, this video is on

00:00:09.208 --> 00:00:10.180

adding and subtracting rational

00:00:10.224 --> 00:00:11.748

expressions and rational expressions.

00:00:11.750 --> 00:00:13.162

Remember, they're like fractions,

00:00:13.162 --> 00:00:16.289

but the top and the bottom are polynomials,

00:00:16.290 --> 00:00:18.971

so let's start by looking at adding

00:00:18.971 --> 00:00:20.510

or subtracting fractions like.

00:00:20.510 --> 00:00:25.000

Let's say that what I have is 11 fifteenths.

00:00:25.000 --> 00:00:27.348

Tractor third from that.

00:00:27.350 --> 00:00:29.210

So in order to do that,

00:00:29.210 --> 00:00:30.988

the bottoms need to be the same.

00:00:30.990 --> 00:00:32.545

The denominators need to be

00:00:32.545 --> 00:00:34.445

the same and here, right?

00:00:34.445 --> 00:00:36.817

So this is $3 * 5$,

00:00:36.817 --> 00:00:38.793

so if this had a factor of five

00:00:38.793 --> 00:00:40.426

in the bottom, then we'd be OK.

00:00:40.426 --> 00:00:41.504

They would be the same, right?

00:00:41.504 --> 00:00:43.628

I can make that into 15

00:00:43.628 --> 00:00:45.139
by multiplying it by 5.

00:00:45.140 --> 00:00:46.700
I can't just multiply the bottom by 5.

00:00:46.700 --> 00:00:49.342
I also have to multiply the top by 5 right,

00:00:49.342 --> 00:00:51.150
which really amounts to

00:00:51.150 --> 00:00:52.958
multiply the whole thing.

00:00:52.960 --> 00:00:53.791
By what right?

00:00:53.791 --> 00:00:55.176
And doesn't really change it,

00:00:55.180 --> 00:00:56.594
so this is now going to be.

00:00:58.860 --> 00:01:05.470
11:15 minus 5:15 right so first of all,

00:01:05.470 --> 00:01:07.548
I make the bottoms agree, and I do

00:01:07.548 --> 00:01:09.384
that by multiplying essentially by one.

00:01:09.390 --> 00:01:11.805
I'm just fitting in the missing factors,

00:01:11.810 --> 00:01:13.306
right? This is missing a factor of five.

00:01:13.310 --> 00:01:14.314
Just fit that in.

00:01:14.314 --> 00:01:16.897
And then what I do is I'm just going

00:01:16.897 --> 00:01:19.066
to subtract right across the top,

00:01:19.066 --> 00:01:22.010
so this becomes 6:15.

00:01:22.010 --> 00:01:23.216
And then I'm not quite done.

00:01:23.220 --> 00:01:24.170
Actually I need to think,

00:01:24.170 --> 00:01:25.910
well, OK, can I simplify that?

00:01:25.910 --> 00:01:28.745
And I can write because this is.

00:01:28.750 --> 00:01:34.150
 $2 * 3$ and the bottom is $5 * 3$.

00:01:34.150 --> 00:01:36.285
Alright, I factor the tops in the

00:01:36.285 --> 00:01:38.886
bottom and then I can cancel any kind

00:01:38.886 --> 00:01:40.990
of common factor in this is $2/5$.

00:01:40.990 --> 00:01:43.190
So it's going to work just the same.

00:01:43.190 --> 00:01:44.558
With rational expressions.

00:01:46.600 --> 00:01:48.106
And let's do a quick example.

00:01:48.110 --> 00:01:49.370
So rational expressions it's

00:01:49.370 --> 00:01:51.260
going to be something like this.

00:01:51.260 --> 00:01:53.450
It's going to be one over.

00:01:53.450 --> 00:02:00.830
 $X - 3 - 6$. Over $X^2 - 9$.

00:02:00.830 --> 00:02:03.189
OK, so now it's it's not obvious.

00:02:03.190 --> 00:02:04.715
I think you know what's

00:02:04.715 --> 00:02:05.630
the common denominator.

00:02:05.630 --> 00:02:08.024
So what I need to do is.

00:02:08.030 --> 00:02:11.090
I need to factor everything insight

00:02:11.090 --> 00:02:13.388
right the top and that's fine.

00:02:13.390 --> 00:02:15.910
One in six, but I need two if

00:02:15.910 --> 00:02:19.410
possible factor the bottoms so.

00:02:19.410 --> 00:02:20.970
This guy doesn't factor right?

00:02:20.970 --> 00:02:23.958
So this is just one over.

00:02:23.960 --> 00:02:25.220
 $X - 3$ we can.

00:02:25.220 --> 00:02:27.770
We can write that as that's

00:02:27.770 --> 00:02:29.470
just one factor there.

00:02:29.470 --> 00:02:31.717
OK, and then here we've got 6.

00:02:31.720 --> 00:02:33.778
This is the difference of two squares,

00:02:33.780 --> 00:02:37.139
so this factor is as $X - 3$.

00:02:40.590 --> 00:02:45.622
 $X + 3$. So. The bottoms

00:02:45.622 --> 00:02:47.086
are very similar, right?

00:02:47.086 --> 00:02:49.018
But this one is missing a factor

00:02:49.018 --> 00:02:50.948
of $X + 3$ that's over here,

00:02:50.950 --> 00:02:53.083
so we need somehow to fit that in there,

00:02:53.090 --> 00:02:55.538
and so I can do that just by.

00:02:55.540 --> 00:02:56.620
Just like up here right?

00:02:56.620 --> 00:02:58.220
We multiplied by 1 essentially

00:02:58.220 --> 00:03:00.559
and we'll do the same thing here.

00:03:00.560 --> 00:03:05.369
I'm going to multiply this guy by $X + 3$.

00:03:05.370 --> 00:03:06.758
Over $X + 3$.

00:03:13.290 --> 00:03:16.209
Right? This is the same as this,

00:03:16.210 --> 00:03:18.513
but it's just we're changing the way

00:03:18.513 --> 00:03:21.608
that we're representing it and then here.

00:03:21.610 --> 00:03:23.270
We're not going to mess with this guy at all.

00:03:27.710 --> 00:03:28.880
Let me switch sites here so.

00:03:31.000 --> 00:03:32.880
OK, so now the denominators,

00:03:32.880 --> 00:03:34.030
the bottoms are the same,

00:03:34.030 --> 00:03:35.260
even though the order is different.

NOTE Confidence: 0.902093512

00:03:35.260 --> 00:03:36.418
That's OK, right?

00:03:36.418 --> 00:03:38.348
Because we can multiply those

00:03:38.348 --> 00:03:40.059
factors in either order.

00:03:40.060 --> 00:03:43.040
And now what I do is just like up here,

00:03:43.040 --> 00:03:44.937
right? I just here I just subtract across

00:03:44.937 --> 00:03:46.987
the top and then if possible simplify.

00:03:46.990 --> 00:03:47.584
Same thing here.

00:03:47.584 --> 00:03:49.160
I'm just going to subtract across the top,

00:03:49.160 --> 00:03:50.555
so this becomes.

00:03:50.555 --> 00:03:53.810
Let me do my little arrow thing.

00:03:53.810 --> 00:03:58.535
 $X + 3$ it's this guy right times one.

00:03:58.540 --> 00:03:59.600
Minus 6.

00:04:01.800 --> 00:04:03.888
And then let's say we get

00:04:03.888 --> 00:04:04.932
that same denominator,

00:04:04.940 --> 00:04:07.700
right the same bottom. So $X - 3$.

00:04:10.530 --> 00:04:13.274
 $X + 3$. So that's just again right.

00:04:13.280 --> 00:04:14.520
Just subtract across the tops.

00:04:14.520 --> 00:04:16.082
Keep the bottom the same, right?

00:04:16.082 --> 00:04:17.894
That's exactly what's going on there.

00:04:17.900 --> 00:04:18.764
And then, if possible,

00:04:18.764 --> 00:04:20.320
we want we want to simplify that.

00:04:20.320 --> 00:04:24.110
So this is $X + 3 - 6$ is $X - 3$.

00:04:28.120 --> 00:04:29.290

That's one factor.

00:04:32.340 --> 00:04:34.030

Oh, I switched him. See it. It's just.

00:04:37.450 --> 00:04:39.538

It doesn't matter the order so much that

00:04:39.538 --> 00:04:41.959

I just accidentally switched them right,

00:04:41.960 --> 00:04:44.972

but this bottom and this bottom are the same.

00:04:44.972 --> 00:04:47.455

So OK, now on the top and bottom there's

00:04:47.455 --> 00:04:49.568

a common factor of $X - 3$. I can cancel

00:04:49.568 --> 00:04:51.669

that when I cancel it from the top.

00:04:51.670 --> 00:04:53.034

I've canceled everything really.

00:04:53.034 --> 00:04:55.826

I'm like I'm dividing that $X - 3$ by

00:04:55.826 --> 00:04:59.000

$X - 3$ so it's going to leave a one.

00:04:59.000 --> 00:05:03.220

So I just get here $1 / X$.

00:05:03.220 --> 00:05:06.098

Plus three, so these things, you know,

00:05:06.098 --> 00:05:08.730

this is a long road through this problem,

00:05:08.730 --> 00:05:09.850

but it's doable, right?

00:05:09.850 --> 00:05:12.648

What we need to do is at the beginning.

00:05:12.650 --> 00:05:14.134

Factor stuff so we can see OK?

00:05:14.140 --> 00:05:15.380

What are the factors right?

00:05:15.380 --> 00:05:17.300

And there are the factors.

00:05:17.300 --> 00:05:18.200

Then we need to say OK,

00:05:18.200 --> 00:05:20.825

so what's missing in the bottom over

00:05:20.825 --> 00:05:22.775

here and maybe also things would

00:05:22.775 --> 00:05:24.731

be missing here that are appearing

00:05:24.731 --> 00:05:26.957

there and we just then fix that.

00:05:26.960 --> 00:05:29.310

Right and the way we fix it is we multiply

00:05:29.368 --> 00:05:31.720

the top and bottom by the missing factors.

00:05:31.720 --> 00:05:33.085

OK, once they have the same bottom,

00:05:33.090 --> 00:05:35.310

you just subtract across the top

00:05:35.310 --> 00:05:36.420

and then you're just down to,

00:05:36.420 --> 00:05:37.620

you know,

00:05:37.620 --> 00:05:38.820

reducing fractions,

00:05:38.820 --> 00:05:39.910

so that's it.