

## Math-1003b Homework #2 Solutions

### Reading

- Text book sections 7.3 and 7.4.

### Problems

1). Simplify:

$$\frac{3x}{x^2 + 6x + 9} - \frac{x}{x^2 + 5x + 6}$$

Start by factoring everything:

$$\frac{3x}{(x+3)^2} - \frac{x}{(x+2)(x+3)}$$

Next, determine the LCM. List all of the unique factors in all denominators and then take the highest power of each factor:

$$LCM = (x+2)(x+3)^2$$

Now, combine the two rational expressions using the LCM as the common denominator, and multiplying each numerator by what is “missing” in the corresponding denominator:

$$\frac{3x(x+2) - x(x+3)}{(x+2)(x+3)^2}$$

Next, use polynomial multiplication and addition to simplify the numerator. Note that this is the only time that we expand things. Be careful of the minus sign!:

$$\frac{(3x^2 + 6x) - (x^2 + 3x)}{(x+2)(x+3)^2}$$

$$\frac{(3x^2 - x^2) + (6x - 3x)}{(x+2)(x+3)^2}$$

$$\frac{2x^2 + 3x}{(x+2)(x+3)^2}$$

Finally, factor the numerator to see if anything cancels with the denominator; nothing does in this case:

$$\frac{x(2x+3)}{(x+2)(x+3)^2}$$

2). Simplify:

$$\frac{2}{a+b} - \frac{2}{a-b} + \frac{4a}{a^2 - b^2}$$

$$\frac{2}{a+b} - \frac{2}{a-b} + \frac{4a}{(a+b)(a-b)}$$

$$\frac{2(a-b) - 2(a+b) + 4a}{(a+b)(a-b)}$$

$$\frac{2a - 2b - 2a - 2b + 4a}{(a+b)(a-b)}$$

$$\frac{(\cancel{2a} - \cancel{2a} + 4a) + (-2b - 2b)}{(a+b)(a-b)}$$

$$\frac{4a - 4b}{(a+b)(a-b)}$$

$$\frac{4(\cancel{a-b})}{(a+b)(\cancel{a-b})}$$

$$\frac{4}{a+b}$$