

Homework #3 Part A

1. Multiply the following to obtain a simplified polynomial:

(a): $(x^2 + 2)(x^2 + x + 1)$ (b): $(x^2 + 2x - 1)(x^3 + 3)$

(c): $(a - b)(a^2 + ab + b^2)$ (d): $(a + b)(a^2 - ab + b^2)$

(Parts (c) and (d) can be very handy in factoring cubics.)

2. Find the following quotients of polynomials by polynomial long division:

(a): $2x^9 + 4x^8 - 5x^5 - 10x^4 + 2x^2 + x - 6$ divided by $x + 2$.

(b): $x^6 + 2x^4 - 3x^3 - 8x - 4$ divided by $x^3 + 2x + 1$.

(c): $x^7 - 7x^3 - x^2 + 6x - 3$ divided by $x^2 + 3$.

3. Confirm that $x = 5$ is a solution to $x^3 - 3x^2 - 13x + 15 = 0$ using synthetic division, and then find all solutions by completely factoring the polynomial.

4. Find all solutions to $x^3 - 3x + 2 = 0$.

5. Find the quotient of $x^4 + 3x^3 + 10x^2 + 9x + 7$ divided by $x^2 + x + 1$. From this, factor $x^4 + 3x^3 + 10x^2 + 9x + 7$ as a product of two quadratics. Use what you know about quadratics to explain why $x^4 + 3x^3 + 10x^2 + 9x + 7 = 0$ has no solutions.

6. Find all values of x which force the expression

$$\frac{x^8 - x^2 + 2x - 5}{x^3 - x^2 - 9x + 9}$$

to be undefined.

Note: This expression is undefined exactly when the denominator is 0, since division by 0 is what would cause problems. So the numerator is irrelevant here.

Review problem from last week:

7. Find all values of x such that $x^2 - 10x + 16 = 0$, then all values such that $x^2 - 10x + 16 > 0$, then all x such that $x^2 - 10x + 16 < 0$. Use this information to draw a rough sketch of $y = x^2 - 10x + 16$ in the coordinate plane.

Homework #3 Part B

Write the rational expressions in Problems 1 through 4 as a polynomial (or constant) plus a simplified rational expression:

1. $\frac{3x^2 + 2x + 1}{x^2 - 3x + 2}$

2. $\frac{2x^4 - x^2 + 2x - 3}{x + 2}$

3. $\frac{x^5 + 1}{x^3 - 1}$

4. $\frac{x^5 + 2x + 1}{x^3 + x + 1}$

5. Find all values of x which make the following expressions 0 (That is, find where the numerator is 0, then make sure for those values of x the denominator is *not* 0):

(a): $\frac{x^2 - 12x + 27}{x^3 + 5x + 2}$

(b): $\frac{x^3 + 2x^2 + x - 4}{x^4 + x + 1}$

(c): $\frac{x^2 - x - 2}{x^3 + x^2 + x + 1}$

6. Find all values of x such that $2 + \frac{4}{x^2 + 2x - 1} = 0$, and all values of x which make $2 + \frac{4}{x^2 + 2x - 1}$ undefined.

7. Find all values of x such that $\frac{x - 2}{x - 1} > 0$.