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Polynomial Equations and Inequalities (1)

1. Express each division in terms of the quotient, divisor, and remainder.

a. $\frac{x^3+x-8x^2+37}{x+4}$, $x\neq-4$

b. $\frac{x^5-2x^4-7x^3+13x^2+2x-18}{x^2-2x-3}$, $x\neq-1,3$

2. When a polynomial $P(x)$ is divided by $x+3$, the quotient is $3x^2-5x+4$ and the remainder is -10. Find $P(x)$ in standard form.

3. Find the divisor given the divident, quotient, and remainder.

a. The dividend is $3x^3-5x^2-7x-1$, the quotient is $3x^2+4x+5$, and the remainder is 14.
b. The dividend is $2x^4+11x^3+5x^2-31x+7$, the quotient is $2x^2+3x-5$, and the remainder is $-8x+2$

4. The volume of a cylinder is given by $(\pi x^3+4\pi x^2-3\pi x-18\pi)$ cm^3. If the radius of the cylinder is $(x+3)$ cm, determine the height of the cylinder in terms of x.

5. When $P(x)$ is divided by $(x+1)$, the remainder is 3. What is the remainder when $xP(x)$ is divided by $(x+1)$?

6. Determine the value(s) of k, $k \in \mathbb{R}$:

a. if $x-5$ is a factor of $x^3+2x^2+kx+30$

b. if $2x+3$ is a factor of $2x^3+kx^2-2x+15$

7. State the equation of any cubic polynomial that has a remainder of -6 when divided by $x+3$.

8. Find the value of a and b if x^2-5x+4 is a factor of the polynomial $2x^3+ax^2+bx-4$. Express the polynomial in factored form.

9. Given the polynomial $P(x)= 4x^3+x^2-7x+3$

a. Using the rational root theorem, list the potential rational roots of $P(x)= 0$.
b. Show $P\left(\frac{3}{4}\right) = 0$. What is a linear factor of $P(x)$?
c. Determine the corresponding quadratic factor.

10. A polynomial $P(x)$ has a remainder of 3 when divided by $x-2$ and a remainder of -5 when it is divided by $x+2$. Determine the remainder when the polynomial is divided by x^2-4.