Polynomial Long Division

Name **ANSWERS**

Directions: The following problems deal with division of polynomials. Be sure to show your work!

1. Divide $x^2 - 3x - 54$ by $x + 6$.

This problem factors easily.

$(x+6)(x-9) = x^2 - 3x - 54$

ANS: $x - 9$

2. Solve: $x-4\overline{)x^3 - 8x^2 + 17x - 4}$

$x^2 - 4x + 1$

$x^3 - 4x^2$

$-4x^2 + 17x$

$-4x^2 + 16x$

$x - 4$

$x - 4$

3. Find $(3x^3 + 9x^2 + 8x + 4) \div (x + 2)$.

$3x^2 + 3x + 2$

4. Simplify: $\dfrac{x^3 - x^2 - 4x + 4}{x - 2}$

$x^2 + x - 2$

5. Is $(2x + 1)$ a factor of $4x^3 - 12x^2 + 3x + 5$?
Show work to support your answer.

Yes. $(4x^3 - 12x^2 + 3x + 5) \div (2x + 1) = 2x^2 - 7x + 5$

6. Solve: $3x-2\overline{)3x^4 - 5x^3 + 2x^2 + 3x - 2}$

$x^3 - x^2 + 0x + 1$

$3x^4 - 2x^3$

$-3x^3 + 2x$

$-3x^3 + 2x$

$0 + 3x - 2$

$3x - 2$

7. Simplify: $\dfrac{x^3 - 13x - 12}{x + 3}$

$x^2 - 3x - 4$

8. Find: $(x^3 + 11x^2 + 38x + 40) \div (x^2 + 6x + 8)$

$x + 5$

9. The formula for the volume of a square pyramid is $V = \frac{1}{3}Bh$ where B is the area of the square base and h is the height of the pyramid. If the volume of a pyramid is represented by $\frac{1}{3}(x^3 + 9x^2 + 24x + 20)$, and the height of the pyramid is $(x + 5)$, what expression represents the length of the side of the base of the pyramid?

$Bh = x^3 + 9x^2 + 24x + 20$

$B = \frac{x^3 + 9x^2 + 24x + 20}{x + 5} = x^2 + 4x + 4$

side of base $= \sqrt{B} = \sqrt{x^2 + 4x + 4} = x + 2$

10. The determine the value of the coefficients p and q if the polynomial $x^3 + px^2 + qx - 12$ is divisible by $x^2 + 2x + 3$.

$$x^2 + 2x + 3 \overline{)\, x^3 + px^2 + qx - 12}$$

$x - 4$

$x^3 + 2x^2 + 3x$

$(p - 2)x^2 + (q - 3)x - 12$

$-4x^2 \quad -8x \quad -12$

$p - 2 = -4 \rightarrow p = -2$

$q - 3 = -8 \rightarrow q = -5$

11. The product of three integers is represented by $(x^3 + 3x^2 + 2x)$. If one of the integers is represented by $x+1$, find expressions to represent the other two integers. How could you describe these integers?

$\frac{x^3 + 3x^2 + 2x}{x + 1} = x^2 + 2x = x(x + 2)$

consecutive integers: $x,\ x + 1,\ x + 2$

12. Simplify: (a) $\frac{x^3 - 8}{x - 2}$ and (b) $\frac{x^3 - a^3}{x - a}$.

(*a*) $\frac{x^3 - 8}{x - 2} = x^2 + 2x + 4$

(*b*) $\frac{x^3 - a^3}{x - a} = x^2 + ax + a^2$

Note the pattern.

13. Simplify: $\frac{x^3 - 1/27}{x - 1/3}$ Use the pattern from #12. $x^2 + \frac{1}{3}x + \frac{1}{9}$