MATH 123 **Exponents and Polynomials**

1. Simplify the expression completely, performing the indicated operations.

$\left(2x^2y\right)\left(-3xy^3\right)$

$\left(\frac{1}{2}xy^3\right)^2\left(-8x^3y\right)$

$\frac{2xy^3z^2}{4x^2yz}$

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

$\frac{x^{-2}}{x^{-5}}$

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

$\frac{4x^2\left(yz\right)^2}{2\left(x^2y\right)^3z}$

$\frac{\left(2x^2yz^4\right)^3}{\left(4x^2y^3z^3\right)^2}$

$\left(\frac{24\left[x\left(yz\right)^2\right]^2}{60x^2\left(y^2z\right)^2}\right)^3$

$\left[\left(2x^2\right)^2\right]^3$

$\left(-2xy^2z^3\right)^3$

$3\left(2a^2bc^3\right)^2bc^2$

$\left(3x^{2n}\right)^2$

$\left(2x^ay^{b+3}c^2\right)^2$

$\left(2a\left[b\left(cd^3\right)^{-1}\right]^3\right)^{-2}$

$\left[2\left(3ab^2\right)^2c\right]^2$

$\left(x^{-2}y^3z^{-3}\right)^{-2}\left(x^{-1}yz^{-2}\right)^3$

2. Write in scientific notation.

0.0003 −0.00215 −63

2,598,960 27,000,000 0.00000078

3. Write in decimal notation.

2.7×10^6 -7.4×10^{-2} 3×10^4 3.45×10^{-5}

4. Simplify completely, expressing the solution using decimal notation.

$\frac{27{,}000{,}000}{3{,}000{,}000{,}000}$

$\left(3\times10^4\right)\left(2\times10^{-2}\right)$

$\frac{2.7\times10^6}{3\times10^4}$

$\frac{6.4\times10^{-3}}{8\times10^2}$

$\left(4\times10^3\right)\left(3\times10^{-5}\right)$

$\frac{8.1\times10^4}{2.7\times10^{-4}}$

$\frac{1.25\times10^{-6}}{2.5\times10^{-2}}$

$\frac{0.000216}{0.000006}$

$\left(4\times10^2\right)\left(1.25\times10^{-1}\right)$

5. State the degree of the given monomial.

x

$2x^3$

$-4xy$

$\frac{2}{3}x^2yz^3$

$7x^3y^2z^4$

7

$\frac{2}{5}x$

$3x^my^n$

$6xyz$

$4x^5y^3z^4$

$\frac{3}{7}$

π

$-9x^3y^2zw^5$

$xyzwv$

$\frac{x^2yz^3w}{3}$

6. State the degree, the leading coefficient, and the constant term for the given polynomials.

$2x^5-9x^4+11x^3+2x+4$

$4x^2-9x^6+14x-22+7x^8$

$-5x^7+4x^2+3x-2$

$\frac{2}{3}-10x$

$-2x^3+3x^2-3x+4$

$9-2x^2-3x^4+7x^5$

π

$9y-10y^2+25y^3$

$p+5p^2+6p^3$

$14a^2+15a-9$

7. Which of the following are not polynomials? Explain why.

$x^3 - \sqrt{3x} + 9$

$\frac{2x^2 + 3x - 4}{4x^2 + 6x - 8}$

$\frac{4}{x}$

$3^{2x^2+8x-11}$

$x^2 + 5x - 2 + 3x^{-1} + 2x^4$

$\sqrt{3x^4 - 7x^2 + 4}$

8. Which of the following are polynomial functions? Explain why. For the polynomial functions, state the leading coefficient, the degree, and the constant term.

$f(x) = -5x^7 + 4x^2 + 3x - 2$

$k(x) = \frac{4}{x}$

$p(x) = 3^{2x^2+8x-11}$

$q(y) = 9y - 10y^2 + 25y^3$

$g(x) = \frac{2}{3} - 10x$

$l(x) = x^2 + 5x - 2 + 3x^{-1} + 2x^4$

$r(p) = p + 5p^2 + 6p^3$

$h(x) = x^3 - \sqrt{3x} + 9$

$m(x) = \frac{2x^2 + 3x - 4}{4x^2 - 6x - 8}$

$s(a) = 14a^2 + 15a - 9$

$j(x) = -2x^3 + 3x^2 - 3x + 4$

$n(x) = 9 - 2x^2 - 3x^4 + 7x^5$

9. Find the indicated function value for the given polynomial function.

$f(x) = -\frac{1}{2}x^3 + \frac{1}{4}x^2 + 3x - 2$, $f(2)$

$g(x) = \frac{2}{3} - 10x$, $g(9)$

$j(x) = -2x^3 + 3x^2 - 3x + 4$, $j(1)$

$m(x) = 2x^2 + 3x - 4$, $m(2)$

$s(a) = 14a^2 + 15a - 9$, $s(0)$

$n(x) = 4x^2 + 6x - 7$, $n(-1)$

$q(y) = 9y - 10y^2 + 25y^3$, $q(0)$

$p(x) = \pi$, $p(19)$

10. Perform the indicated operation. Simplify completely.

$(5x^3 - 7x^2 + 3) - (x^3 + 2x^2 - x + 8)$

$3(2z + x) - 5(2x + 3y - 7z)$

$(7x^4 - x^2 + 4x^2 - 2) + (3x^3 - 9x^2 + 11x + 4)$

$5(7x + 2y) - 4(7x - 2y)$

$4x^2 - 7 - 4(3x^3 + 2x^2 - 5x + 1)$

$2(2x^3 + 7x^2 - 4) - 3(7 + 8x - x^3)$

$-2(2z + y) + 3(3z - 4y)$

$3(9xy - z) - (3xy + 7zy) - 8(2xy - z)$

$2(8x^2 - 8x + 2) - 2(3x^3 - 7x^2 - x + 8)$

$4(3x^2 + y^2 - 2z^2) - 9(7x^2 - 2y^2)$

$(5xy + 4) + (4 - 5xy)$

11. Perform the indicated operation, simplifying completely.

$(x - 2)(x + 3)$

$(2x + 3)(x - 3)$

$(2x + 3)^2$

$(x + 2)(x - 3)$

$(2x - 1)(2x + 1)$

$(2x - 3)^2$

$(x - 4)(x - 7)$

$(x + 3)^2$

$(2x - 7)(3x + 4)$

$(x + 4)(x + 7)$

$(x - 3)^2$

$(2x + 3)(x + 3)$