9.1 When we know it's a

Polynomial

at least one term

degree - highest exponent

can't have negative exponents
fraction or radical exponents

whole number exponents

No variables in the denominator

Rational

$\frac{x+5}{10} = \frac{3x}{30}$ ratios

9.2 Exponent Rules

$2^5 \cdot 2^3 = 2^8$

$\frac{7a^5}{21a^3} = \frac{a^2}{3}$ or $\frac{1}{3}a^2$

$\frac{(2a^{-5}b^3)^2}{4a^{-2}b^{-3}} = \frac{2^2a^{-10}b^6}{4a^{-2}b^{-3}} = \frac{b^9}{a^8}$

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

$x(2x^2 + 3x + 1)$

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

9.3 Solving Rational Equations

$\frac{x+2}{18} \times \frac{x}{10}$

$10(x+2) = 18x$

$10x + 20 = 18x$

$\frac{20}{8} = \frac{8x}{8}$

$2.5 = x$

$\frac{x}{x-2} + \frac{30}{x+2} = 9$ $\quad (x-2)(x+2)$ $(x+2)(x-2)$ $(x-2)(x+2)$

$\frac{x(x+2)}{(x-2)(x+2)} + \frac{30(x-2)}{(x-2)(x+2)} = \frac{9(x-2)(x+2)}{(x-2)(x+2)}$ $\quad x^2-4$

$x^2 + 2x + 30x - 60 = 9x^2 - 36$

$0 = 8x^2 - 32x + 24$

$0 = 8(x^2 - 4x + 3)$

$0 = 8(x-3)(x-1)$

$x = 3, 1$

9.4 Graphing Cubic

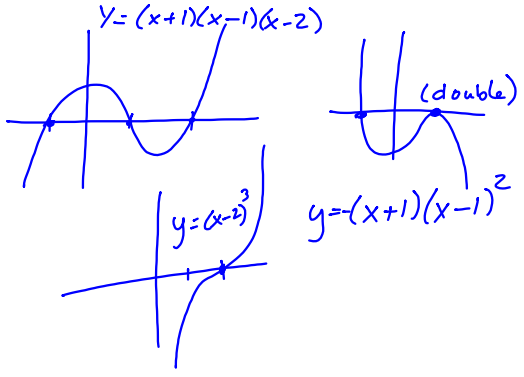
What are the roots (zeros) of the function

Between 1 and 3 roots

Double $y = (x+1)^2(x-2)$

Triple $y = (x-5)^3$

$y = (x-1)(x+2)(x+7)$



9.5 Solving Cubic functions

$y = (x-1)(x+2)(x-5)$

$x = -1, -2, 5$

$y = 2x^3 + 10x^2 + 12x$

$y = 2x(x^2 + 5x + 6)$

$y = 2x(x+3)(x+2)$

$x = -3, -2, 0$

quadratic formula

$y = x^2 - 2x + 7$

$a=1 \quad b=-2 \quad c=7$

$\frac{2 \pm \sqrt{4-28}}{2}$

$\frac{2 \pm \sqrt{-24}}{2}$

$\frac{2 \pm \sqrt{24}\,i}{2}$

$\frac{2 \pm 2\sqrt{6}\,i}{2}$

$1 \pm \sqrt{6}\,i$

$1 \pm 2.45i$

9.6 Parametric Equations

Two variables in relation to time t

Solve for t, then substitute

$x = t + 3$

$x - 3 = t$

$y = 2t + 5$

$y = 2(x-3) + 5$

$y = 2x - 6 + 5$

$y = 2x - 1$

$x = 20t$

$\frac{1}{20}x = t$

$y = 10 - 4.9t^2$

$y = 10 - 4.9\left(\frac{x}{20}\right)^2$

$y = 10 - \frac{4.9}{400}x^2$

$0 = 10 - \frac{4.9}{400}x^2$

$\frac{400}{4.9} \cdot -10 = -\frac{4.9}{400}x^2 \left(\frac{400}{4.9}\right)$

$\sqrt{816.32} = \sqrt{x^2}$

$28.6 = x$