Algebra review

- The distributive law: $a(b+c) = ab + ac$

- Factoring out a term: $A + B + X + C = X\left(\dfrac{A}{X} + \dfrac{B}{X} + 1 + \dfrac{C}{X}\right)$
  $\uparrow$

- Laws of exponents ($a > 0$): $\circ$ $a^{-n} = \dfrac{1}{a^n}$ $\circ$ $\sqrt[n]{a} = a^{1/n}$ (and $\sqrt{a} = a^{1/2}$)

  $\circ$ $a^{m+n} = a^m \cdot a^n$ $\circ$ $a^{m-n} = \dfrac{a^m}{a^n}$

  $\circ$ $(ab)^n = a^n b^n$ $\circ$ $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

  $\circ$ $a^{mn} = (a^m)^n$ $\circ$ $a^0 = 1$

- Factoring sums & differences of powers: $a^2 - b^2 = (a-b)(a+b)$,
  $$a^3 - b^3 = (a-b)(a^2 + ab + b^2),$$
  $$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

- Absolute values: $|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$

- The Binomial Theorem: $(a+b)^2 = a^2 + 2ab + b^2$,
  $$(a+b)^3 = a^3 + 3a^2 b + 3ab^2 + b^3,$$
  etc. (coefficients come from Pascal's triangle)

- The Quadratic Formula: if $ax^2 + bx + c = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Basic trigonometry

- Angles will always be measured in radians, with positive meaning counterclockwise.
  2π radians is a full circle, so you can convert degrees to radians via multiplying by $\dfrac{2\pi}{360}$.

- The three basic trig functions (remember, down and left are negative!):

  $\circ$ $\sin\theta = \dfrac{\text{opp}}{\text{hyp}}$ $\circ$ $\cos\theta = \dfrac{\text{adj}}{\text{hyp}}$ $\circ$ $\tan\theta = \dfrac{\text{opp}}{\text{adj}}$

- Be able to find evaluate trig functions of the "nice angles" $\dfrac{k\pi}{1,\ 2,\ 3,\ 4,\ \text{or } 6}$.

- Trigonometric identities: $\circ$ Pythagorean: $\sin^2\theta + \cos^2\theta = 1$, and
  $\circ$ Sum/difference: $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$, and
  $$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

Graphs of basic functions

$y = x^2$

$y = x^3$

$y = \dfrac{1}{x} = x^{-1}$

$y = \sqrt{x} = x^{1/2}$

$y = \sqrt[3]{x} = x^{1/3}$

$y = |x|$

$y = \ln x$

$y = \exp x = e^x$

$y = \tan x$

$y = \sin x$

$y = \cos x$