Thurs. wk 1

Algebra Review:

Exponents:

$$A^m A^n = A^{m+n}$$

multiply like bases … add exponents

base $= A$

Similar Example

$$(x+y)^5 (x+y)^3 = (x+y)^8$$

base can be 'complicated'

$$\sin(x)^1 (\cos(x))^5 \cdot \sin^3(x) = \sin^4(x) \cos^5(x)$$

base $= \sin(x)$

$$\frac{A^m}{A^n} = A^{m-n}$$

dividing like bases … subtract exponents

The reason?

$$\frac{A^m}{A^n} = \frac{A^m}{1} \cdot \frac{1}{A^n} = \frac{A^m}{1} \cdot A^{-n} = A^{m-n}$$

---

negative exponents … invert and change sign

$$\frac{5}{x^3} = 5x^{-3}$$

$$\frac{5}{x^3+1} \neq \frac{5x^{-3}}{+1}$$

$$\frac{5}{\frac{1}{x^2}+1} = \frac{5}{\frac{1}{x^2}+\frac{x^2}{x^2}}$$

$$= \frac{5}{\left[\frac{1+x^2}{x^2}\right]} = \frac{5x^2}{1+x^2}$$

$$\frac{5}{\frac{1}{x^2}} = \frac{5}{\frac{x^{-2} \cdot 1}{1}} = \frac{5}{x^{-2}} = 5x^2$$

divide by a fraction … multiply by the reciprocal

---

breaking up fractions

$$\frac{5x^2}{1+x^2} \neq \frac{5x^2}{1} + \frac{5x^2}{x^2}$$

but

$$\frac{1+x^2}{5x^2} = \frac{1}{5x^2} + \frac{x^2}{5x^2}$$

Fractional Exponents

Square Root of $x = \sqrt{x}$, notice when we multiply it by itself we get x back.

$$\sqrt{x}\cdot\sqrt{x} = x$$
$$\|$$
$$x^{\frac{1}{2}}x^{\frac{1}{2}} = x^1 = x$$

$$\sqrt[m]{x^n} = x^{n/m}$$

recall $\sqrt{x} = \sqrt[2]{x} = x^{1/2}$

Factoring & Fractional Exponents

$$x^2y + x^2z = x^2(y+z)$$

$$x^{3/2}y + x^{1/2}z = x^{1/2}(x^{3/2-1/2}y + x^{1/2-1/2}z) = x^{1/2}(xy+z)$$

Expanding Binomials & Common Forms

$(x+y)^2 = x^2 + 2xy + y^2$ | $(x-y)^2 = x^2 - 2xy + y^2$

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

$$= x(x^2 + 2xy + y^2) + y(x^2 + 2xy + y^2)$$

$$= x^3 + 2x^2y + xy^2 + x^2y + 2xy^2 + y^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

$$(x-y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

Pascal's $\triangle$ tracks coefficients

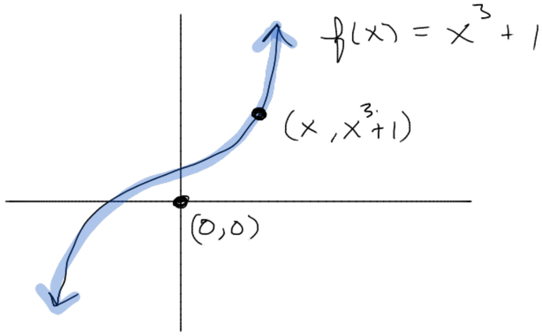
Degree sum is constant

$$(x+y)^4 = x^4 + 4x^3y + 6x^2y^2 + 4x^1y^3 + y^4$$

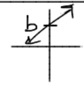
$$(x-y)^4 = x^4 - 4x^3y + 6x^2y^2 - 4xy^3 + y^4$$

Geometry

Cartesian Plane



$y = mx + b$



★ $y - y_1 = m(x - x_1)$

slope formula: (isolate m) $\dfrac{y - y_1}{x - x_1} = m$

perpendicular: negative

parallel: same slope

---

common exercise.

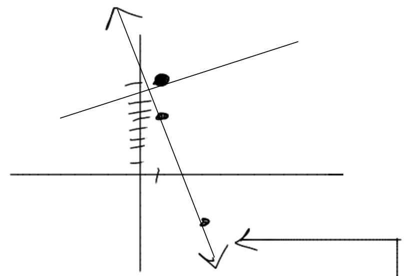
Find an equation of a line perpendicular to the line between (1, 5) and (2, -3) that goes through (1, 8).

① $m = \dfrac{5-(-3)}{1-2} = \dfrac{8}{-1} = -8$

② $y - y_1 = m(x - x_1)$

(1, 8)

$\boxed{y - 8 = -8(x-1)}$



① Find this slope

② combine this slope w/ (1,8) in line formula