1) $(2x^3)(5x^{-3})(3x)$

① Multiply numbers
② add exponents of variables

Times two of them together first

$10x^{3+(-3)} = 10x^0 = 10$

now multiply by the third

$10(3x) = \boxed{30x}$

2) $(-4x^{-2}y^3)(3x^4y^{-3})$

$-12x^{(-2)+4}y^{3+(-3)}$

$-12x^2y^0 = \boxed{-12x^2}$

3) $\frac{6x^2y^5}{3x^4y}$

① Simplify the numbers

② When you divide variables you subtract the powers. (top power − bottom power)

$\frac{6}{3}\ \frac{x^2}{x^4}\ \frac{y^5}{y}$

$2x^{2-4}\ y^{5-1}$

$2x^{-2}y^4$ negative powers switch levels

$\frac{2y^4}{x^2}$

4) $\dfrac{21\ x^{-4}\ y^{-3}}{12\ x^{4}\ y^{-2}}$

$\dfrac{21}{12}\ \dfrac{x^{-4}}{x^{4}}\ \dfrac{y^{-3}}{y^{-2}}$

$\dfrac{7}{4}\ x^{(-4)-4}\ y^{(-3)-(-2)}$

$\dfrac{7}{4}\ x^{-8}\ y^{-1}$ $\boxed{= \dfrac{7}{4x^{8}y}}$

5) $(4x^2+2x-6)-(3x^2-3x-6)$ Combine Like Terms

DISTRIBUTE THE NEGATIVE

$4x^2+2x-6-3x^2+3x+6$

$1x^2+5x+0$

$\boxed{x^2+5x}$

6) $(5x^2+2x-3)+3(4x^2-x-3)$

DISTRIBUTE

$5x^2+2x-3+12x^2-3x-9$

$\boxed{17x^2-1x-12}$

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

$x^2+2x-4x-8$

$\boxed{x^2-2x-8}$

8) $(3x-3y)(4x-5y)$

$12x^2-15xy-12xy+15y^2$

$\boxed{12x^2-27xy+15y^2}$

9) $\dfrac{12x^3y^5 - 32xy}{4xy}$

SPLIT UP EACH TERM AND SIMPLIFY

$$\frac{12x^3y^5}{4xy} - \frac{32xy}{4xy}$$

$$3x^{3-1}y^{5-1} - 8x^{1-1}y^{1-1}$$

$$3x^2y^4 - 8x^0y^0$$

$$\boxed{3x^2y^4 - 8}$$

10) $\dfrac{6x^3y^2 - x^2y^{-4}}{3x^2y^{-3}}$

$\dfrac{6x^3y^2}{3x^2y^{-3}} - \dfrac{x^2y^{-4}}{3x^2y^{-3}}$

$2x^{3-2}y^{2-(-3)} - \dfrac{1}{3}x^{2-2}y^{(-4)-(-3)}$

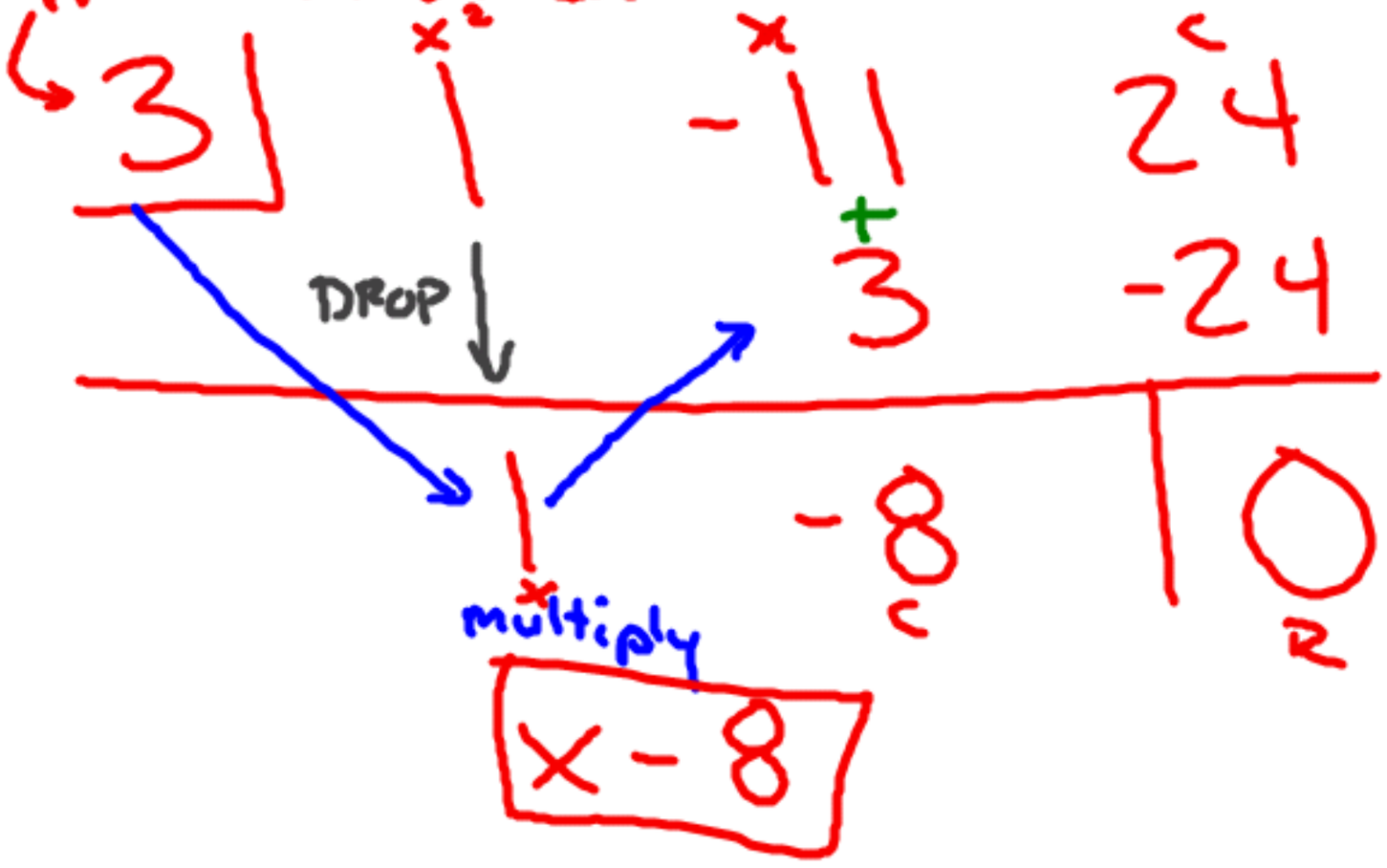
$2xy^5 - \dfrac{1}{3}x^0y^{-1}$

$\boxed{2xy^5 - \dfrac{1}{3y}}$

11) $\dfrac{x^2-11x+24}{x-3}$

Synthetic Division

opposite of divisor



12) $\dfrac{x^3+2x^2-3x+1}{x-5}$

	x^3	x^2	x	c	
5	1	2	−3	1	
		5	35	160	
	1	7	32	161	
	x^2	x	c	R	

$$1x^2+7x+32+\frac{161}{x-5}$$

13)

$$x+1 \overline{)\, x^2+4x+2}$$

$x + 3$

$-x^2 \mp x$

$3x + 2$

$-3x \mp 3$

-1 ← remainder

$$x+3+\frac{-1}{x+1}$$

(1) Match the 1st Term in the dividend

(2) Switch signs & combine like terms

(3) Drop the next term.

(4) Repeat steps until all terms are used

14)

$$x+2 \;\overline{)\; x^3+2x^2+0x-1}$$

x^2+0x+0

missing power needs a zero term so we get like terms

$-x^3 \mp 2x^2$

$0x^2+0x$

$-0x^2 \mp 0x$

$0x-1$

$-0x \mp 0$

-1 remainder

$$x^2+0x+0+\frac{-1}{x+2}$$

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

15) $\frac{2y^5}{2y^5} + \frac{8x^3y^7}{2y^5}$ GCF

GCF: $2y^5$

$2y^5(1 + 4x^3y^2)$ not able to factor further so we're done

16) $\frac{5ax^2}{5a} - \frac{15a^3x^4}{5a} + \frac{5a^2}{5a}$ GCF: $5a$

$5a(x^2 - 3a^2x^4 + a)$

17) $x^2 - 7x + 10$

3 TERMS, NO GCF
so multiply 1st & last
rewrite middle term
and factor by grouping

$1 \cdot 10 = 10$

add up to middle term → $-5 \quad -2$

$(x^2 - 5x)(-2x + 10)$

$x(x-5) - 2(x-5)$

$(x-5)(x-2)$

18) x^3+17x^2+72x GCF: x

$x(x^2+17x+72)$

still factorable

$1\cdot 72 = 72$

$9 \quad 8$

$x(x^2+9x)(+8x+72)$

$x(x+9)+8(x+9)$

$\boxed{x(x+9)(x+8)}$

19) $16x^2 - 8x + 1$

① Multiply 1st & last

$16 \cdot 1 = 16$

$-4 \quad -4$

② Find factors that add up to middle number

$(16x^2 - 4x)(-4x + 1)$

③ Rewrite middle term

$4x(4x-1) - 1(4x-1)$

④ Factor by grouping

$(4x-1)(4x-1)$

20) $7x^2 - 14x + 7$

GCF: 7

$7(x^2 - 2x + 1)$ -1 -1 1

leftover is factorable

$7((x^2 - 1x)(-1x + 1))$

$7[x(x-1) - 1(x-1)]$

$7(x-1)(x-1)$

21) $8x^2 + 18x - 5$ $\quad 8 \cdot (-5) = -40$

$20 \quad -2$

$(8x^2 + 20x)(-2x - 5)$

$4x(2x+5) - 1(2x+5)$

$\boxed{(4x-1)(2x+5)}$

22) $3x^2+27x-30$ $\quad 3(-30)=-90$

30 -3

$(3x^3+30x)(-3x-30)$

$3x(x+10)-3(x+10)$

$(3x-3)(x+10)$

GCF=3

$\boxed{3(x-1)(x+10)}$

23) $9n^3-21n^2+12n-28$

4 TERMS SO FACTOR BY GROUPING

$(9n^3-21n^2)(+12n-28)$

$3n^2(3n-7)+4(3n-7)$

$\boxed{(3n^2+4)(3n-7)}$

24) $(48b^3+40b^2)(-42b-35)$

$8b^2(6b+5)-7(6b+5)$

$(6b+5)(8b^2-7)$

25) $x^3 - 27$ x^3 & 27 are cubes

formula: $(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$

$(x^3 - 27) = (x-3)(x^2 + x \cdot 3 + 3^2)$

$a = x$

$b = 3$

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

* a is what is cubed to make 1st term
* b is what is cubed to make 2nd term

26) $8x^3+125$

$a=2x$

$b=5$

formula:

$(a^3+b^3)=(a+b)(a^2-ab+b^2)$

$(8x^3+125)=(2x+5)((2x)^2-(2x)(5)+5^2)$

$=(2x+5)(4x^2-10x+25)$