① Is $(x-4)$ a factor of $-2x^3+5x^2-x+3$?

NO

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

$$f(4) = -49$$

② Is $2x-1$ a factor of $f(x) = x^3 - 3x^2 + 4$?

$2x-1=0$

$x=\frac{1}{2}$

$x=0.5$

$f(0.5) = (0.5)^3 - 3(0.5)^2 + 4$

$f(0.5) = 3.375 \neq 0$

NO

⑦ $\frac{x^2+9}{x+3i}$

$(-3i)(-3i)$

$9i^2$

$i^2 = -1$

$9i^2$

$9(-1) = -9$

$-3i \mid 1 \quad 0 \quad 9$

$\qquad\quad -3i \quad -9$

$1 \quad -3i \quad 0$

Quotient $= x - 3i$ $\quad R = 0$

5.5 Rational (Fractional) Root (x-int) Theorem

possible rational zeros $= \frac{p\text{'s}}{q\text{'s}} = \frac{\text{Factors of constant}}{\text{Factors of leading coefficient}}$

1. $y = x^3 + 5x^2 + 2x - 8$

possible rational zeros $= \dfrac{\text{Factors of } -8}{\text{Factors of } 1} = \dfrac{\pm 1, 2, 4, 8}{\pm 1}$

$= \pm 1, 2, 4, 8$

Find when $f(x) = 0$

If $(x-a)$ is a factor of $f(x)$

then $f(a) = 0$

Is $(x-3)$ a factor of

$f(x) = x^3 - 3x^2 - 4x + 12$?

$f(3) = 3^3 - 3(3)^2 - 4(3) + 12$

$f(3) = 0$

Yes

Is $(2x+1)$ a factor of

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

$2x+1=0$

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

$x = -0.5$

$f(x) = 2(-0.5)^4 - 3(-0.5)^2 + (-0.5) - 5$

$f(x) = -6.125$

NO

⑦ $\dfrac{x^2+9}{x+3i}$

$(-3i)(-3i)$

$9i^2$

$i^2=-1$

$9(-1)$

-9

$-3i$	1	0	9
		$-3i$	-9
	1	$-3i$	0

Quotient $= x-3i$

Rational Roots Theorem

fractional x-int

All possible rational zeros $= \frac{p}{q} = \frac{\text{Factors of constant}}{\text{Factors of leading coefficient}}$

① $y = x^3 + 5x^2 + 2x - 8$

possible rational zeros $= \dfrac{\text{Factors of } 8}{\text{Factors of } 1} = \dfrac{\pm 1, 2, 4, 8}{\pm 1} = \pm 1, 2, 4, 8$

$f(1) = 0$

So, $(x-1)$ is a factor

1	1	5	2	−8
		1	6	8
	1	6	8	0

to divide $\frac{f(x)}{x-1}$

$f(x) = (x-1)(x^2+6x+8)$

$f(x) = (x-1)(x+4)(x+2)$

x-int = $1, -4, -2$