20. p463 $18x^4+15x^3-34x^2+15x-2=0$

$+18x^4-15x^3-34x^2-15x-2=0$

p: $\pm 1 \quad \pm 2$

q: $\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$

$\frac{p}{q}$: $\pm 1, \pm\frac{1}{2}, \pm\frac{1}{3}$ DR, $\pm\frac{1}{6}, \pm\frac{1}{9}, \pm\frac{1}{18}$

$\pm 2, \pm\frac{2}{3}, \pm\frac{2}{9}$

3 or 1 positive

1 neg

$x=2$

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

$x=\frac{1}{3}$ DR

18	15	-34	15	-2

12 (3) or 1 pos

− − − −
0 neg

$\frac{-B}{A}$ Sum Roots

12 $x=1$ $x=2$ $x=\frac{1}{4}$

$A=4$
$B=-13$

$-\frac{-13}{4}=\frac{13}{4}=3\frac{1}{4}$

23. $P(x) = 3x^3 - 1x^2 - 24x + 8$

$P(-x) = -3x^3 - x^2 + 24x + 8$

p: $\pm 1, \pm 2, \pm 4, \pm 8$

q: $\pm 1, \pm 3$

Sum of Roots: $\frac{-B}{A} = \frac{-1}{3} = \frac{1}{3}$

$\frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm 8, -\frac{1}{3}, \pm\frac{2}{3}, -\frac{4}{3}, \pm\frac{8}{3}$

Possible Rational

2 or 0 Positive Real Roots

1 Negative Real Roots

3 Total 3 x-intercepts

3 → 2 Positive Real | Negative Real

3 → 0 Positive Real | Negative Real

2 imaginary

Imaginary Root Conjugate Pairs

ex $2+3i$ $2-3i$

$\frac{1}{3}$ + − $\frac{1}{3}$

$\frac{1}{3}$	3	-1	-24	8
		1	0	-8
	3	0	-24	0
	x^2	x	c	R

$3x^2 - 24 = 0$

Solve

$\frac{3x^2}{3} = \frac{24}{3}$

$\sqrt{x^2} = \sqrt{8}$

$x = \pm 2\sqrt{2}$

$x = \frac{1}{3}$

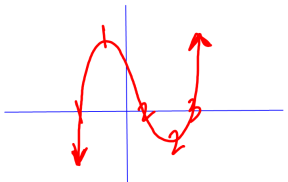
$3(x^2 - 8) = 0$

$\sqrt{8}$

$\sqrt{4 \cdot 2}$

$\sqrt{4}\sqrt{2}$

$2\sqrt{2}$



p464

2. $f(x) = x^3 - 5x^2 + 9x - 45$

$f(-x) = -x^3 - 5x - 9x - 45$

p $\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45$

q ± 1

$\frac{p}{q}$ $\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45$

3 or 1 pos real roots

0 neg real roots

$3 \to 3$ pos real

$3 \to 1$ pos real 2 imaginary

5	1	-5	9	-45
		5	0	45
	1	0	9	0
	x^2	x	C	R

$x^2 + 9 = 0$ Set=0

$\sqrt{x^2} = \sqrt{-9}$

$x = \pm 3i$ $x = 5$

p464 24, 28, 32