2.1-2.3 Review

1 $-3x^2+30x+5$

$\frac{-b}{2a} = \frac{-30}{-3(2)} = \frac{-30}{-6} = 5$

vertex: (5, 80)

$y = -3(x-5)^2+80$

$-3(5)^2+30(5)+5 = -75+150+5 = 80$

2 **Power**

one term - variable to a power

ex: $2x^3$ — constant: 2, Power: 3 — Direct variation

$2x^{1/3}$ — constant: 2, Power: $\frac{1}{3}$ — Direct variation

$2x^{-3}$ — constant: 2, Power: -3 — Inverse variation

Monomial (Both power and polynomial)

one term (non negative powers)

$2x^3$

Polynomial

can have multiple terms

no negative powers (integers)

$2x^3$ LC: 2 D: 3

$2x^3+3x-1$ LC: 2 D: 3

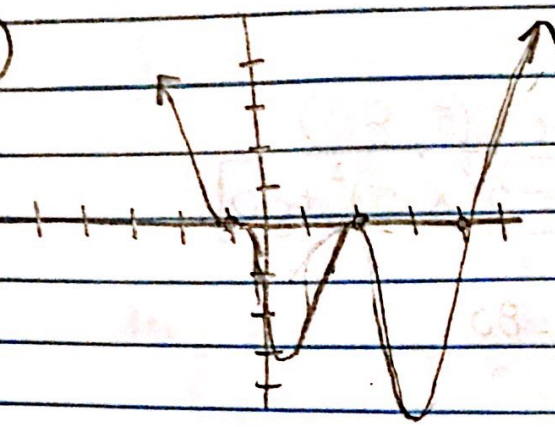
3 $f(x) = (x-1)^3(x+6)^2(2x-3)$

$(0-1)^3(0+6)^2(2(0)-3)$

$-1(36)(-3) = 108$

y-intercept: $(0, 108)$

$\lim_{x \to \pm\infty} f(x) = \infty$

④ 

$f(x) = (x-4)(x+1)^3(x-2)^2$

Zeros: $4, -1, 2$

-1: slide, 2: Bounce

Degree: x^6 – even

positive LC

end behavior ↑↑

⑤ $f(9) = 3$, $f(1) = 15$

$(9,3)$ $(1,15)$

$\frac{15-3}{1-9} = \frac{12}{-8} = -\frac{3}{2}$

$y - 3 = -\frac{3}{2}(x-9)$

$y - 3 = -\frac{3}{2}x + \frac{27}{2}$

$+3 \qquad +3$

$\boxed{y = -\frac{3}{2}x + 33/2}$

⑥ $2x^3 \underbrace{-2x^5}_{} + 5x - 1$

$\lim_{x \to \infty} f(x) = -\infty$ $\lim_{x \to -\infty} f(x) = \infty$

⑦ $-\frac{x^3}{5} = -\frac{1}{5}x^3$

yes!

Constant: $-1/5$

Direct variation

⑧ V: $(3,7)$ $f(9) = -137$

$y = a(x-h)^2 + k$

$-137 = a(-9+3)^2 + 7$

$-144 = a(-6^2)$

$-144 = 36a$

$-4 = a$

$\boxed{y = -4(x+3)^2 + 7}$

9 a. Strong negative
b. Weak positive
c. Strong positive

10 $x = 1, 3, -5$ y-intercept $y = -30$

$f(x) = a(x-1)(x-3)(x+5)$
$-30 = a(0-1)(0-3)(0+5)$
$-30 = a(-1)(-3)(5)$
$-30 = a(15)$
$-2 = a$

$$\boxed{y = -2(x-1)(x-3)(x+5)}$$

2.4 - 2.9 Review

1 $2x+4 \overline{)\, 6x^4 + 0x^3 - 8x^2 + 10x - 1}$

$3x^3 - 6x^2 + 8x - 11$

$6x^4 \quad 12x^3$
$-12x^3 - 8x^2$
$-12x^3 - 24x^2$
$16x^2 + 10x$
$16x^2 + 32x$
$-22x - 1$
$-22x - 44$
43

$$\boxed{3x^3 - 6x^2 + 8x - 11 + \frac{43}{2x+4}}$$

2 $3+5i$

	1	-8	31	22	-510
$3+5i$		$3+5i$	$-40-10i$	$23-75i$	510
$3-5i$	1	$-5+5i$	$-9-10i$	$45-75i$	0
		$3-5i$	$-6+10i$	$-45+75i$	
	1	-2	-15	0	

$x^2 - 2x - 15 = 0$
$(x-5)(x+3)$

A) Zeros: $5, -3, 3+5i, 3-5i$

B) $f(x) = (x-5)(x+3)(x-(3+5i))(x-(3-5i))$

③ $f(x) = x^4 - 7x^3 + 13x^2 + 23x - 78$

(A) $3^4 - 7(3)^3 + 13(3)^2 + 23(3) - 78 = 0$ yes!

(B) $4^4 - 7(4)^3 + 13(4)^2 + 23(4) - 78 = 30$ No!

(C) $1^4 - 7(1)^3 + 13(1)^2 + 23(1) - 78 = \boxed{-48}$

(D) $(-2)^4 - 7(-2)^3 + 13(-2)^2 + 23(-2) - 78 = \boxed{0}$

④ $\left(\frac{\sqrt{3}}{4} + \frac{5}{4}i\right)\left(\frac{\sqrt{3}}{4} + \frac{5}{4}i\right) = \frac{3}{16} + \frac{5\sqrt{3}}{16}i + \frac{5\sqrt{3}}{16}i + \frac{25}{16}i^2$

$\frac{3}{16} + \frac{10\sqrt{3}}{16}i + \frac{25}{16}(-1) = -\frac{22}{16} + \frac{10\sqrt{3}}{16} = \boxed{-\frac{11}{8} + \frac{5\sqrt{3}}{8}i}$

⑤ $u = 2 - 4i$, $v = 6 + 2i$

a. $2 - 4i + 6 + 2i = 8 - 2i$

b. $2 - 4i - (6 + 2i) = -4 - 6i$

c. $(2 - 4i)(6 + 2i) = 12 + 4i - 24i - 8i^2 = 12 - 20i + 8 = \boxed{20 - 20i}$

d $\frac{(2-4i)}{6+2i}\frac{(6-2i)}{(6-2i)} = \frac{12 - 4i - 24i + 8i^2}{36 - 4i^2} = \frac{12 - 28i - 8}{36 + 4} = \frac{4 - 28i}{40} = \boxed{\frac{1}{10} - \frac{7}{10}i}$

e. $2 - 4i - (6 + 2i) = |-4 - 6i| = \sqrt{4^2 + 6^2} = \boxed{\sqrt{52}}$

f. $\frac{2 - 4i + 6 + 2i}{2} = \frac{8 - 2i}{2} = \boxed{4 - i}$

⑥ $\frac{-4(5+6i)}{2-5i} = \frac{-20 - 24i}{2 - 5i}\frac{(2+5i)}{2+5i} = \frac{-40 - 100i - 48i - 120i^2}{4 - 25i^2} =$

$\frac{80 - 148i}{29} = \boxed{\frac{80}{29} - \frac{148}{29}i}$

7 $f(x) = -2x^2 + 12x + 5$

a) $\frac{1,5}{1,2} = \pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}$

b) NO

c) $\frac{-12 \pm \sqrt{144 - 4(-2)(5)}}{2(-2)} = \frac{-12 \pm \sqrt{184}}{-4} < \sqrt{4 \cdot 46} = \frac{-12 \pm 2\sqrt{46}}{-4}$

$\boxed{\frac{6 \pm \sqrt{46}}{2}}$

8 $f(x) = (x-2)(x+1)(x-(1+3i))(x-(1-3i))$

$= (x^2 - x - 2)(x-1-3i)(x-1+3i)$

$(x^2-x-2)(x^2 - x + 3ix - x + 1 - 3i - 3ix + 3i + 9 - 9i^2)$

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

$x^4 - 2x^3 + 10x^2 - x^3 + 2x^2 - 10x - 2x^2 + 4x - 20$

$\boxed{x^4 - 3x^3 + 6x^2 - 6x - 20}$

9 $|-5-2i| = \sqrt{5^2 + 2^2} = \boxed{\sqrt{29}}$

10 $f(x) = \frac{x^2+x+1}{x^2-1} = \frac{x^2+x+1}{(x-1)(x+1)}$

V.A. $x = 1, x = -1$

H.A. $y = 1$

x-intercept: None

y-intercept: $(0, -1)$

$x^2 + x + 1 = 0 \quad \frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$

$\frac{1}{-1} = -1$ plug in zero for x

11

-2	1	1	-2	5
		-2	2	0
	1	-1	0	5

Slant: None

OEBA: $y = x^2 - x$

12. $f(x) = \frac{x}{x+2} + \frac{5}{x-3} = \frac{25}{x^2-x-6}$

$(x+2)(x-3)$

Common Denominator $\frac{x(x-3)+5(x+2)}{(x+2)(x-3)} = \frac{25}{(x+2)(x-3)}$

$x^2-3x+5x+10 = 25$

$x^2+2x-15 = 0$

$(x+5)(x-3)$

$x = -5, \cancel{3}$

13. $\frac{x+3}{x^2-4} \geq 0$

$(x-2)(x+2)$

-4 -2.5 0 3

-3 (+) -2 $\cancel{\text{DNE}}$ 2 (+)

$[-3,-2) \cup (2,\infty)$

14. $\frac{(x-1)|x-4|}{\sqrt{x+3}} > 0$

-4 0 2 5

-3 (−) 1 (+) 4 (+)

$(1,4) \cup (4,\infty)$