Unit 8 Polynomials Review

① $(3x^2-2x+9)-(-6x^2+5x-8)$ distribute the negative!

$3x^2-2x+9+6x^2-5x+8$

$\boxed{9x^2-7x+17}$

② $(x+2)(x^2-3x-4)$

$x^3-3x^2-4x+2x^2-6x-8$

$\boxed{x^3-x^2-10x-8}$

③ $(x+6)^2+(x-6)^2$

$(x+6)(x+6)+(x-6)(x-6)$

$(x^2+6x+6x+36)+(x^2-6x-6x+36)$

$x^2+\cancel{12x}+36+x^2-\cancel{12x}+36$

$\boxed{2x^2+72}$

④ $-5a^4(a^2-3a+1)$

$\boxed{-5a^6+15a^5-5a^4}$

⑤ $(x+6)^2-(x-6)^2$

$(x+6)(x+6)-(x-6)(x-6)$

$(x^2+6x+6x+36)-(x^2-6x-6x+36)$

$\cancel{x^2}+12x+\cancel{36}-\cancel{x^2}+12x-\cancel{36}=\boxed{24x}$

⑥ $(x-1)(x^2+x+1)$

$x^3+\cancel{x^2}+\cancel{x}-\cancel{x^2}-\cancel{x}-1$

$\boxed{x^3-1}$

⑦ $27x^3 - 8y^6$

difference of cubes → SOAP

$a = 3x \quad b = 2y^2$

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

$\boxed{(3x - 2y^2)(9x^2 + 6xy^2 + 4y^2)}$

⑧ $4m^2 + 11m - 20$

-80

$16 \quad -5$

11

$(4m^2 + 16m)(-5m - 20)$

$4m(m+4) - 5(m+4)$

$\boxed{(m+4)(4m-5)}$

⑨ $a^4 - a^2k - 56k^2$

-56

$-8 \quad 7$

-1

$(a^4 - 8a^2k)(+7a^2k - 56k^2)$

$a^2(a^2 - 8k) + 7k(a^2 - 8k)$

$\boxed{(a^2 - 8k)(a^2 + 7k)}$

⑩ $(4x^3 + 6x^2)(-10x - 15)$

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

$\boxed{(2x+3)(2x^2-5)}$

(11)

A. $x^2+x+1 \overline{)\, x^4-2x^3+0x^2-2x+7}$ $\quad x^2-3x+2$

$$\begin{array}{r} -x^4 \cancel{-x^3} \cancel{-x^2} \\ \hline -3x^3-x^2-2x \\ +3x^3 \cancel{+3x^2} \cancel{+3x} \\ \hline 2x^2+x+7 \\ -2x^2 \cancel{+2x} \cancel{+2} \\ \hline -x+5 \end{array}$$

Quotient: x^2-3x+2

Remainder: $-x+5$

B. $x^2+0x+1 \overline{)\, 2x^4+x^3+0x^2-3x+10}$ $\quad 2x^2+x-2$

$$\begin{array}{r} -2x^4 \cancel{+0x^3} \cancel{+2x^2} \\ \hline x^3-2x^2-3x \\ -x^3 \cancel{+0x^2} \cancel{+x} \\ \hline -2x^2-4x+10 \\ +2x^2 \cancel{+0x^2} \cancel{+2} \\ \hline -4x+12 \end{array}$$

Quotient: $2x^2+x-2$

Remainder: $-4x+12$

(12) A. $(3x^3-5x^2+2x-6) \div (x+3)$

First degree binomial

synthetic ☺

$$\begin{array}{r|rrrr} -3 & 3 & -5 & 2 & -6 \\ & \downarrow & -9 & 42 & -132 \\ \hline & 3 & -14 & 44 & \boxed{-138} \end{array}$$

Remainder: -138

B. $(x^3+0x-2) \div (x-1)$

missing x^2 $\quad$ synthetic!

$$\begin{array}{r|rrrr} 1 & 1 & 0 & 6 & -2 \\ & \downarrow & 1 & 1 & 7 \\ \hline & 1 & 1 & 7 & \boxed{5} \end{array}$$

Remainder: 5

(13) Equation w/ degree 3 whose zeros are 4 and -2

one factor is multiplicity 2

$x=4$ $\quad$ $x=-2$

$-4 \quad -4$ $\quad$ $+2 \quad +2$

$(x-4)=0$ $\quad$ $(x+2)=0$

factors

$y=(x-4)(x+2)^2$

OR

$y=(x-4)^2(x+2)$

(14) degree • factored → add exp. • FOIL'ed → biggest exp.

FOIL'ed

A. $y=-3x^{7}+x^{5}-3x^{2}+2$

$\boxed{7}$

Factored

B. $y=2x^{1}(x-4)^{2}(x+2)^{3}(x-3)$

$1+2+3+4=\boxed{10}$

(15) A. $P(x)=x^5-9x^3$

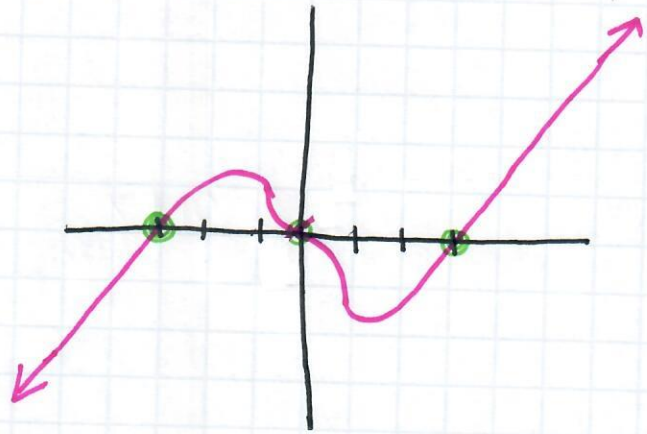
$x^3(x^2-9)$

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

zeros:	0	3	-3
multiplicity:	3	1	1
	wiggle	cross	cross

odd ↗ ↙ +L.C.

y-int (0,0)



B. $P(x)=-2(x-1)(x-2)^2(x+1)^3$

Factored ☺

zeros:	1	2	-1
multiplicity:	1	2	3
	cross	touch	wiggle

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

degree: 6 even ↙ ↓ -L.C.

y-int (0, 8)

(16) A. $Q(x)=-x^2(x^2-4)$

degree: 4 even ↙↓ -L.C.

AS $x\to-\infty$ $y\to-\infty$

AS $x\to\infty$ $y\to-\infty$

B. $S(x)=\frac{1}{2}x^6-2x^4$

degree: 6 even ↑↑ +L.C.

$\lim_{x\to-\infty}\infty$

$\lim_{x\to\infty}\infty$

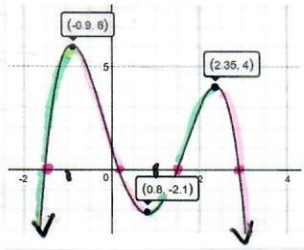
C. $P(x)=x^4-3x^2-4$

degree: 4 even ↑↑ +L.C.

$\lim_{x\to\infty}\infty$

$\lim_{x\to\infty}\infty$

17



A. AS $x \to -\infty$, $y \to -\infty$

AS $x \to \infty$, $y \to -\infty$

B. zeros: $-1.5, .1, 1.5, 2.9$
(approximate)

C. local min: -2.1 @ $x = 0.8$

local max: 6 @ $x = -0.9$
4 @ $x = 2.35$

D. increasing: $(-\infty, -0.9) \cup (0.8, 2.35)$

E. decreasing: $(-0.9, 0.8) \cup (2.35, \infty)$

18 A. $f(x) = x^4 - 3x^3 - 3x^2 + x - 2$

extrema → min: -2.915 @ $x = -0.650$
-27.139 @ $x = 2.761$
max: -1.927 @ $x = 0.139$

increasing: $(-\infty, -0.650) \cup (0.139, 2.761)$

decreasing: $(-0.650, 0.139) \cup (2.761, \infty)$

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

min → -3.879 @ $x = -2.535$

max → 3.065 @ $x = -0.131$

increasing: $(-2.535, -0.131)$

decreasing: $(-\infty, -2.535) \cup (-0.131, \infty)$

*need to zoom out on graph