Int. 3 Chapter 8 DDAY Name Key Per____ Group____

Show all your work for full credit.

Write a polynomial function with rational coefficients in standard form with the given zeros.

1. $-1, 2+i, 2-i$

$y=(x+1)(x-2-i)(x-2+i)$

$y=(x+1)(x^2-4x+5)$

$\boxed{y=x^3-3x^2+x+5}$

	$x-2$	$-i$
$x-2$	x^2-4x+4	/
$+i$	/	$+1$

	x^2	$-4x$	$+5$
x	x^3	$-4x^2$	$5x$
$+1$	$+1x^2$	$-4x$	5

2. $\sqrt{3}, 1, -2$

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

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

$\boxed{y=x^4-x^3-5x^2-3x+6}$

	$x-\sqrt{3}$	
x	x^2	/
$+\sqrt{3}$	/	-3

	$x-1$	
x	x^2	$-x$
$+2$	$2x$	-2

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

3. Factor. $4x^3-108$

$=4(x^3-27)$

$=\boxed{4(x-3)(x^2+3x+9)}$

4. ~~Write as a product of linear factors.~~ FACTOR

$x^4-8x^2+12=0$

$\frac{P}{Q}=\pm1\ \pm2\ \pm3\ \pm4\ \pm6\ \pm12$

2]

1	0	-8	0	12
↓	2	4	-8	-16
1	2	-4	-8	-14 ☹

3]

1	0	-8	0	12
↓	3	9	3	9
1	3	1	3	21 ☹

$\boxed{(x^2-6)(x^2-2)}$

IF SOLVE:

$(x^2-6)(x^2-2)=0$

$\boxed{x=\pm\sqrt{3}}$ $\boxed{x=\pm\sqrt{2}}$

5. Solve. $x^4+4x^3-32x^2=0$

$x^2(x^2+4x-32)=0$

$x^2(x+8)(x-4)=0$

$\boxed{x=0}$ $\boxed{x=-8}$ $\boxed{x=4}$

$\boxed{x=0}$

6. Solve. $6x^3-18x^2-x+3=0$

$\frac{P}{Q}=\frac{\pm1\ \pm3}{\pm1\ \pm2\ \pm3\ \pm6}\rightarrow \pm1, \pm3, \pm\frac{1}{2}\ \frac{1}{3}\ \frac{1}{6}\ \pm\frac{3}{2}$

1]

6	-18	-1	3
↓	6	-12	-13
6	-12	-13	-10 ☹

3]

6	-18	-1	3
↓	18	0	-3
6	0	-1	☺

$\boxed{x=3}$

$6x^2-1=0$

$6x^2=1$

$x^2=\frac{1}{6}$

$\boxed{x=\pm\sqrt{\frac{1}{6}}}$ or $\boxed{\frac{\pm\sqrt{6}}{6}}$

Use long division to divide.

7. $(6x^4+5x^3+8x^2-2x-24)\div(3x+4)$

$$
\begin{array}{r}
2x^3-x^2+4x-6 \\
3x+4\,\overline{)\,6x^4+5x^3+8x^2-2x-24} \\
-(6x^4+8x^3) \\
-3x^3+8x^2 \\
-(-3x^3-4x^2) \\
12x^2-2x \\
-(12x^2+16x) \\
-18x-24 \\
-(-18x-24)
\end{array}
$$

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

Divide using synthetic division.

8. $(-4x^2+x^3-5x+x)\div(x+2)$

$(x^3-4x^2-4x+0)\div(x+2)$

$$
\begin{array}{r|rrrr}
-2 & 1 & -4 & -4 & 0 \\
 & \downarrow & -2 & 12 & -16 \\
\hline
 & 1 & -6 & 8 & -16
\end{array}
$$

$\boxed{x^2-6x+8+\frac{-16}{x+2}}$

9. $(x^3+8)\div(x+2)$

$$
\begin{array}{r|rrrr}
-2 & 1 & 0 & 0 & 8 \\
 & \downarrow & -2 & 4 & -8 \\
\hline
 & 1 & -2 & 4 & \ddot{\smile}
\end{array}
$$

$\boxed{x^2-2x+4}$

Find all the roots.

10. $x^3+9x^2+24x+20=0$

$\frac{P}{Q}=\pm1\ \pm2\ \pm4\ \pm5\ \pm10\ \pm20$

$$
\begin{array}{r|rrrr}
-1 & 1 & 9 & 24 & 20 \\
 & \downarrow & -1 & -8 & -16 \\
\hline
 & 1 & 8 & 16 & 4\ \frown
\end{array}
$$

$$
\begin{array}{r|rrrr}
-2 & 1 & 9 & 24 & 20 \\
 & \downarrow & -2 & -14 & -20 \\
\hline
 & 1 & 7 & 10 & \ddot{\smile}
\end{array}
$$

$\boxed{x=-2}$

$x^2+7x+10=0$

$(x+5)(x+2)=0$

$\boxed{x=-5}$ $\boxed{x=-2}$

11. $x^4+6x^3+10x^2+6x+9=0$

All positive only − roots.

$\frac{P}{Q}=\pm1\ \pm3\ \pm9$

$$
\begin{array}{r|rrrrr}
-1 & 1 & 6 & 10 & 6 & 9 \\
 & \downarrow & -1 & -5 & -5 & -1 \\
\hline
 & 1 & 5 & 5 & 1 & 8\ \frown
\end{array}
$$

$$
\begin{array}{r|rrrrr}
-3 & 1 & 6 & 10 & 6 & 9 \\
 & \downarrow & -3 & -9 & -3 & -9 \\
\hline
 & 1 & 3 & 1 & 3 & \ddot{\smile}
\end{array}
$$

$\boxed{x=-3}$

$$
\begin{array}{r|rrrr}
-3 & 1 & 3 & 1 & 3 \\
 & \downarrow & -3 & 0 & -3 \\
\hline
 & 1 & 0 & 1 & \ddot{\smile}
\end{array}
$$

$\boxed{x=-3}$

$x^2+1=0$

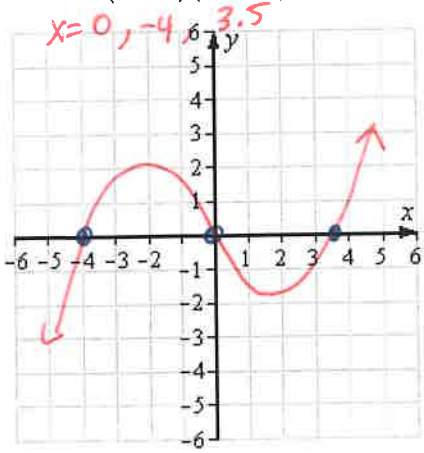
$x^2=-1$

$\boxed{x=\pm i}$

For # 12 - 13, sketch graphs of each. Be sure to label the x-intercepts.

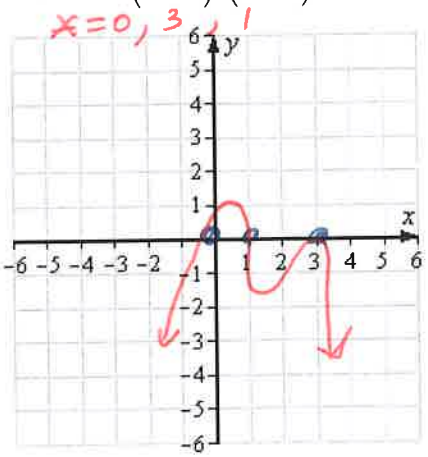
12. $y = x(x+4)(2x-7)$

$x = 0, -4, 3.5$



13. $y = -x(x-3)^2(x-1)$

$x = 0, 3, 1$



14. Write a possible polynomial equation for a graph that passes through the point (1, 27) and has these three x-intercepts: (-2, 0), (2, 0), and (4, 0).

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

$27 = a(1+2)(1-2)(1-4)$

$27 = a(3)(-1)(-3)$

$27 = 9a$

$a = 3$

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

15. Solve. $3x^4 = 48$

$x^4 = 16$

$x^4 - 16 = 0$

$(x^2-4)(x^2+4) = 0$

$\boxed{x = \pm 2}$ $\boxed{x = \pm 2i}$

16. Solve. $\log_4(3x-1) = 3$

$4^3 = 3x - 1$

$64 = 3x - 1$

$65 = 3x$

$\boxed{\frac{65}{3} = x}$

17. Solve. $3(2^x) = 45$

$2^x = 15$

$\log_2 15 = x$

$\boxed{x \approx}$

18. Solve. $\log(x) + \log(4x) = 2$

$\log_{10} 4x^2 = 2$

$10^2 = 4x^2$

$100 = 4x^2$

$25 = x^2$

$\boxed{x = \pm 5}$