

Example:

Polynomial:

$$P(x) = x^3 + 3x^2 + 3x + 1$$

Possible Rational Zeros:

$$\frac{\pm 1}{\pm 1} = \pm 1$$

$$P(-1) = 0$$

$$\begin{array}{r} -1 \overline{) 1 \ 3 \ 3 \ 1} \\ \underline{-1 \ -2 \ -1} \\ 1 \ 2 \ 1 \ 0 \end{array}$$

$$(x+1)(x^2 + 2x + 1)$$
$$(x+1)(x+1)^2$$

\* Please make a sketch for any polynomial that has real zeros\*

Complete Factorization:

$$(x+1)^3$$

Complete Solution Set:

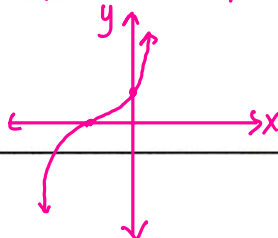
$$-1 \text{ (triple)}$$

zeros:  $-1$  (triple)

y-int:  $(0,1)$



Check: Sketch:

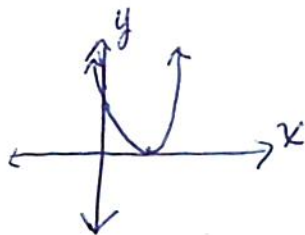


# Sketching Polynomial Graphs Key

②  $y = (x-2)^2$

$z: 2$  (double root)

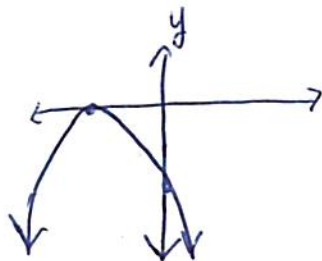
$y$ -int:  $(0, 4)$



③  $y = -(x+3)^2$

$z: -3$  (double root)

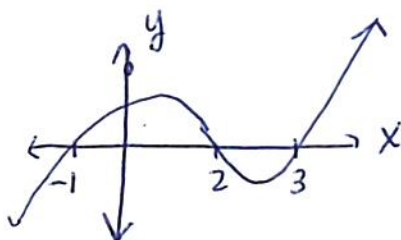
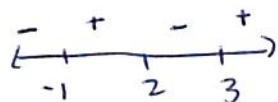
$y$ -int:  $(0, -9)$



④  $y = (x+1)(x-2)(x-3)$

$z: -1, 2, 3$

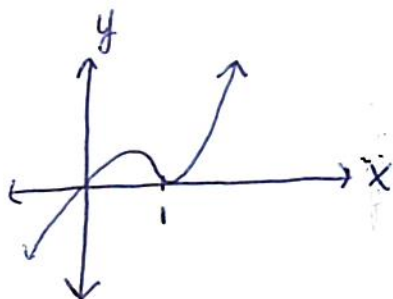
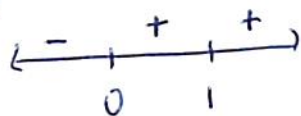
$y$ -int:  $(0, 6)$



⑥  $y = x(x-1)^2$

$z: 0, 1$  (double root)

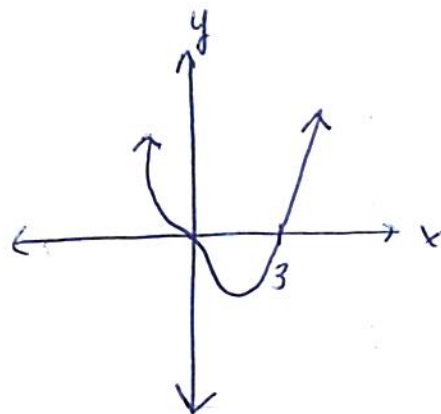
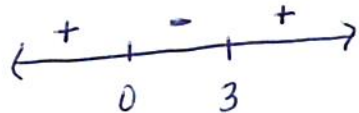
$y$ -int:  $(0, 0)$



⑨  $y = x^3(x-3)$

$z: 0$  (triple root),  $3$

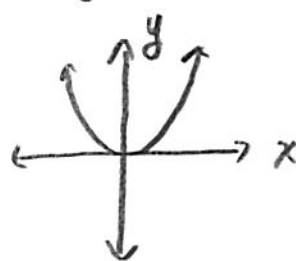
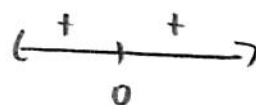
$y$ -int:  $(0, 0)$



①  $y = x^2$

$z: 0$

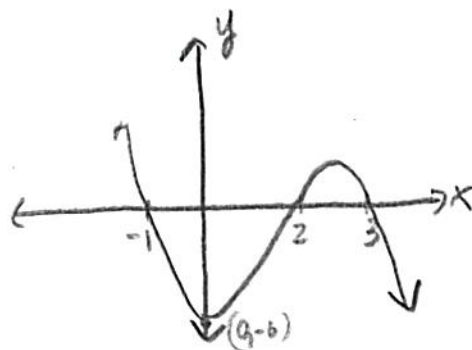
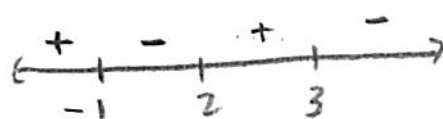
$y$ -int:  $(0, 0)$



⑤  $y = (x+1)(x-2)(3-x)$

$z: -1, 2, 3$

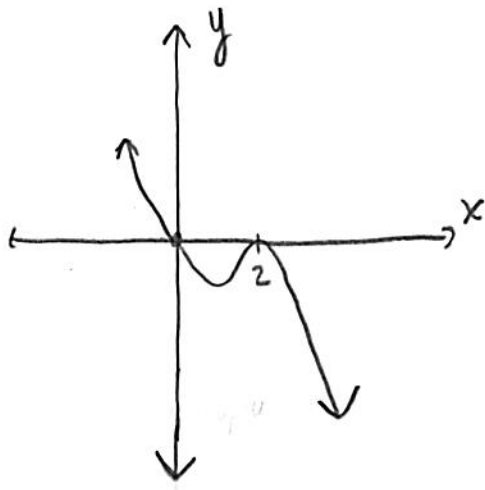
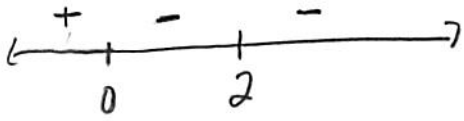
$y$ -int:  $(0, -6)$



$$\textcircled{7} \quad y = -x(x-2)^2$$

z: 2 (double), 0

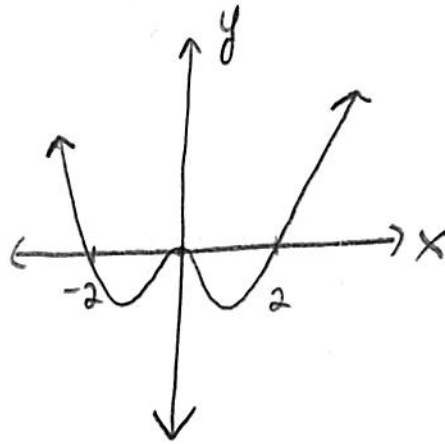
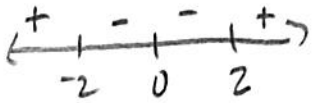
y-int: (0, 0)



$$\textcircled{8} \quad y = x^2(x+2)(x-2)$$

z: 0 (double)  $\pm 2$

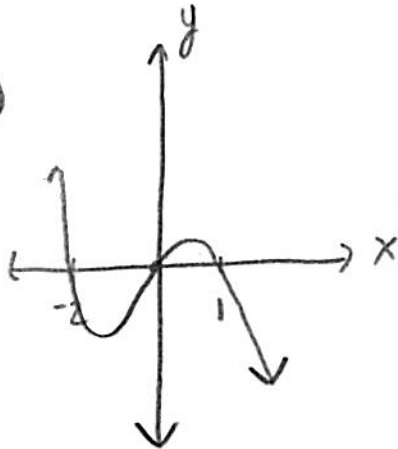
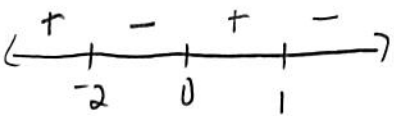
y-int: (0, 0)



$$\textcircled{10} \quad y = -x(x-1)(x+2)$$

z: 0, 1, -2

y-int: (0, 0)

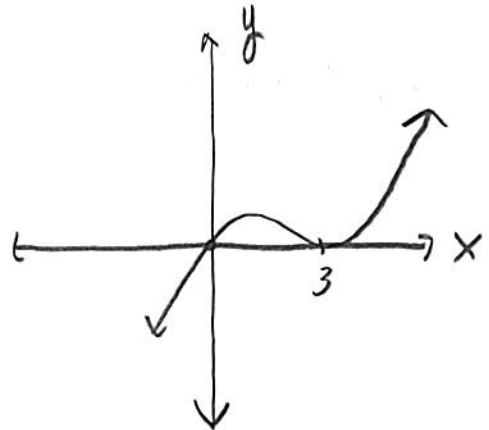
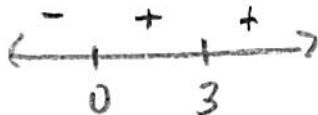


$$\textcircled{11} \quad y = x^3 - 6x^2 + 9x$$

$$y = x(x^2 - 6x + 9)$$

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

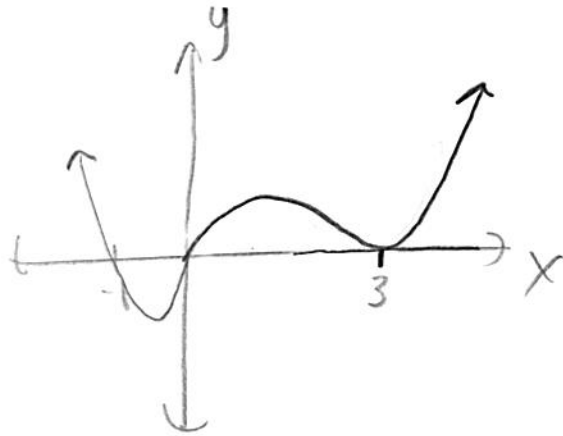
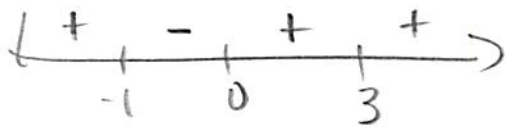
z: 0, 3 (double) y-int: (0, 0)



(16)  $y = x(x+1)(x-3)^2$

$z = 0, -1, 3$  (double root)

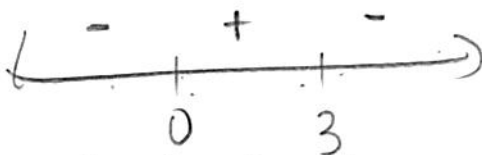
$y$ -int:  $(0,0)$



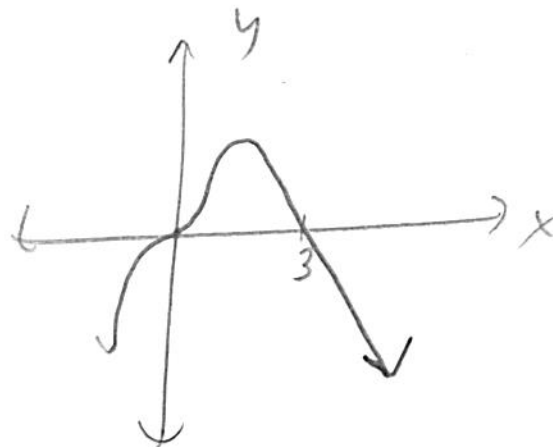
(18)  $y = 3x^3 - x^4$   
 $y = x^3(3-x)$

$z = 0$  (triple),  $3$

$y$ -int:  $(0,0)$



$(0,0)$

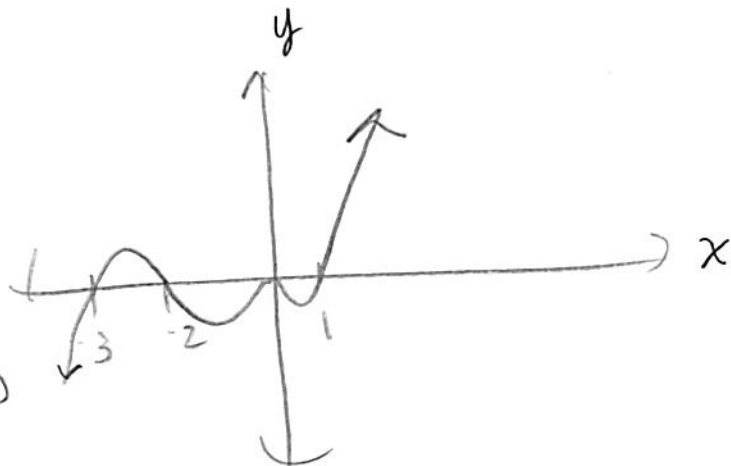
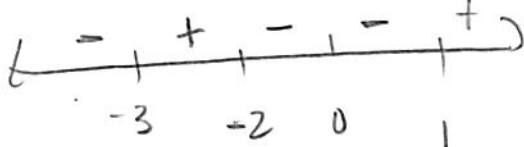


(19)  $y = x^2(x-1)(x+2)(x+3)$   
 $x = 0, 1, -2, -3$

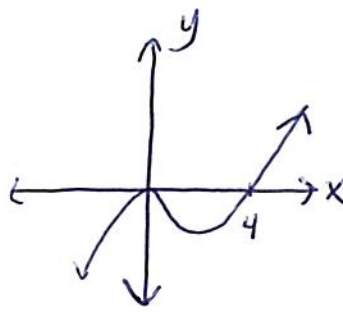
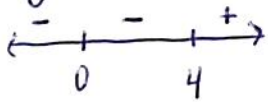
$z$ :

double

$y$ -int:  $(0,0)$



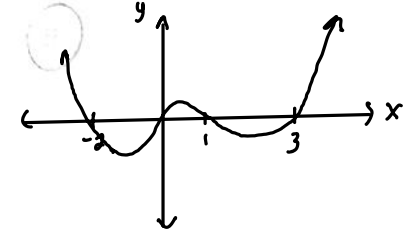
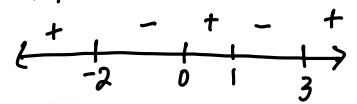
(12)  $y = x^2(x-4)$   
 $z: 0$  (double root), 4  
 $y$ -int:  $(0,0)$



(14)  $y = x(x-1)(x-3)(x+2)$

$z: 0, 1, 3, -2$

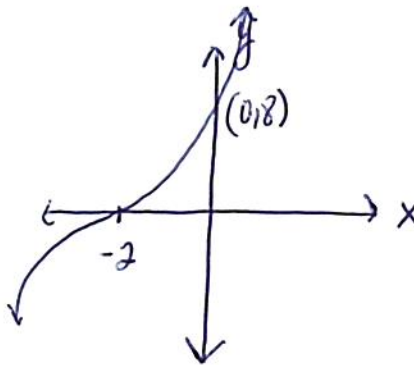
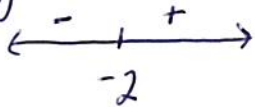
$y$ -int:  $(0,0)$



(13)  $y = (x+2)^3$

$z: -2$  (triple root)

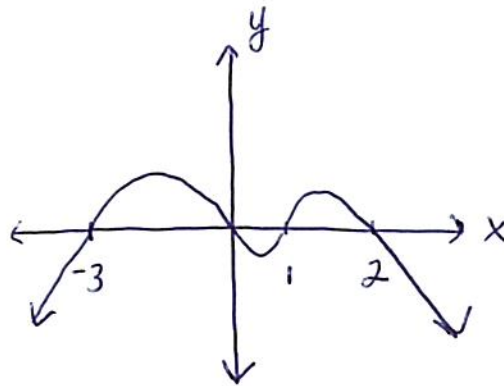
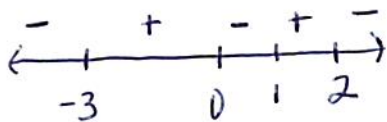
$y$ -int:  $(0,8)$



(15)  $y = x(1-x)(x-2)(x+3)$

$z: 0, 1, 2, -3$

$y$ -int:  $(0,0)$



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

Do Now from 01/05

(20)  $y = (1-x)(2-x)(3-x)(4-x)(5-x)$

$z: 1, 2, 3, 4, 5$

$y$ -int:  $(0,120)$

