

①  $f(x) = x^5 - 9x^4 + 31x^3 - 35x^2 - 24x + 52$   
 grapher shows  $x=2$ , touch &  $x=-1$ , cross  
 Descartes: 4, 2, 0 positive

$f(-x) = -x^5 - 9x^4 - 31x^3 - 35x^2 + 24x + 52$  1 negative

$$\begin{array}{r} 2 \overline{) 1 \quad -9 \quad 31 \quad -35 \quad -24 \quad 52} \\ \underline{\phantom{2} 2 \quad -14 \quad 34 \quad -2 \quad -52} \\ 2 \overline{) 1 \quad -7 \quad 17 \quad -1 \quad -26 \quad 0} \\ \underline{\phantom{2} 2 \quad -10 \quad 14 \quad 26} \\ -1 \overline{) 1 \quad -5 \quad 7 \quad 13 \quad 0} \\ \underline{\phantom{-1} -1 \quad 6 \quad -13} \\ 1 \quad -6 \quad 13 \quad 0 \end{array}$$

$x=2$  won't work again

$x^2 - 6x + 13 = 0$

$b^2 - 4ac = (-6)^2 - 4(1)(13)$

$= 36 - 52$

$= -16$  No real roots

$x = \frac{6 \pm \sqrt{-16}}{2(1)} = \frac{6 \pm 4i}{2} = 3 \pm 2i$

Real zeros:  $x = 2, -1$   
 Nonreal zeros:  $x = 3 \pm 2i$

5pts

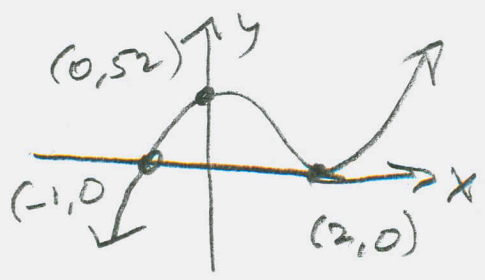
②  $f(x) = (x-2)^2 (x+1) (x^2 - 6x + 13)$

5pts

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

5pts

④



5pts