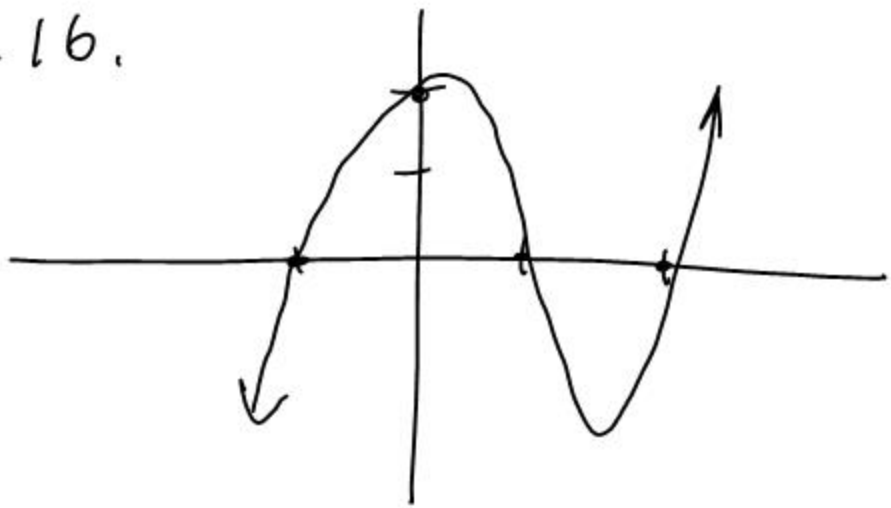
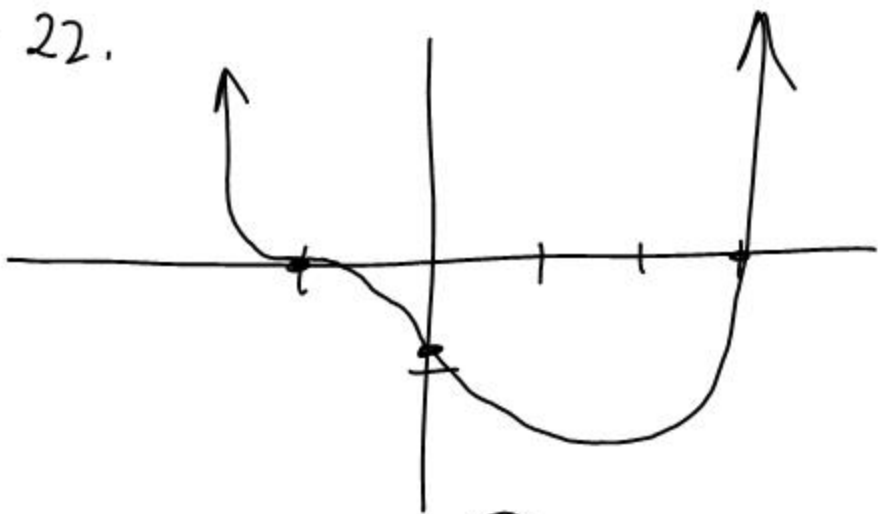


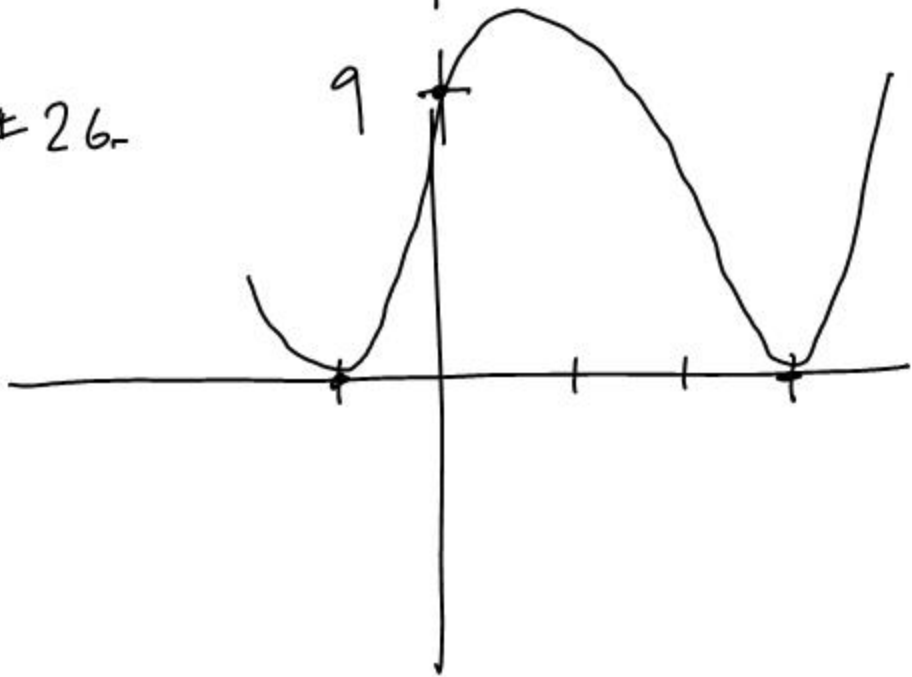
16.



22.

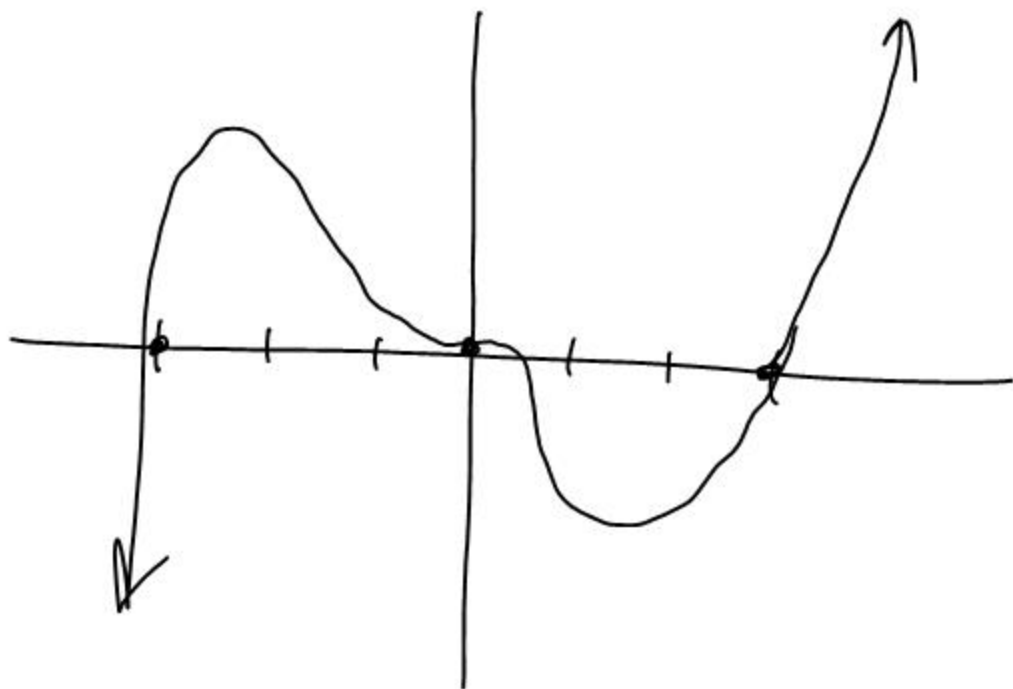


26.



#32. $x^5 - 9x^3$
 $x^3(x^2 - 9)$

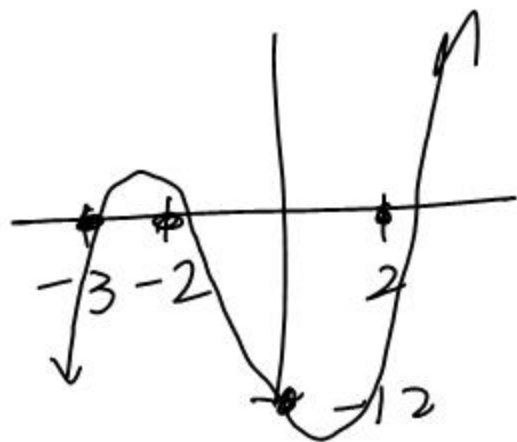
$x^3(x - 3)(x + 3)$



#34. $x^3 + 3x^2 - 4x - 12$
 $x^2(x + 3) - 4(x + 3)$

$(x + 3)(x^2 - 4)$

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



Exercise Find the vertex:

$$\begin{aligned} \text{a) } y &= x^2 - 8x + 1 && \left[\frac{1}{2}(-8)\right]^2 \\ &= (x^2 - 8x + 16) + 1 - 16 \end{aligned}$$

$$\boxed{y = (x - 4)^2 - 15} \quad \underline{V(4, -15)}$$

$$\text{b) } y = 3 - x - 2x^2$$

$$= -2 \left(x^2 + \frac{1}{2}x + \frac{1}{16} \right) + 3 + \frac{1}{8}$$

$$\begin{aligned} &= -2 \left(x + \frac{1}{4} \right)^2 + \frac{25}{8} && \left(\frac{1}{2}\left(\frac{1}{2}\right)\right)^2 \\ & && \left(\frac{1}{4}\right)^2 \end{aligned}$$

$V\left(-\frac{1}{4}, \frac{25}{8}\right)$ $\left(-\frac{1}{4}, \frac{25}{8}\right)$

range: $\underline{(-\infty, \frac{25}{8}]}$

Quiz Fall Equinox

① Find the vertex

$$(a) y = x^2 + 5x + 1$$

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

② Sketch.

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

$$(b) y = (x+2)(x-2)(x+3)$$

Factoring Polynomials

EX. $f(x) = x^3 - 10x^2 + 32x - 32$

~~x ± 3~~

$x ± 1$

$x ± 2$

$x ± 4$

$x ± 8$

$x ± 16$

$x ± 32$

$$\begin{array}{r|rrrr} 1 & 1 & -10 & 32 & -32 \\ & \downarrow & & & \\ \hline & 1 & -9 & 23 & \end{array} \quad \boxed{-9 = f(1)}$$

$$\begin{array}{r|rrrr} 2 & 1 & -10 & 32 & -32 \\ & & 2 & -16 & 32 \\ \hline & 1 & -8 & 16 & \end{array} \quad \boxed{0 = f(2)}$$

$$(x-2)(x^2 - 8x + 16)$$

$$(x-2)(x-4)(x-4)$$

Ex. Factor:

$$f(x) = x^5 - 10x^4 + 36x^3 - 58x^2 + 43x - 12$$

DesCartes' Rule

+	-	+	-	+	-
5 positive roots					
3	"	"			
1	"	"			

$$f(-x) = -x^5 - 10x^4 - 36x^3 - 58x^2 - 43x + 12$$

no sign change \rightarrow no negative roots

$$\begin{array}{r|rrrrrrr} \text{I} & 1 & -10 & 36 & -58 & 43 & -12 & \\ & & & 1 & -9 & 27 & -31 & 12 \\ \hline & 1 & -9 & 27 & -31 & 12 & & \boxed{0} = f(1) \end{array}$$

$$\begin{array}{r|rrrrr} \text{II} & 1 & -9 & 27 & -31 & 12 \\ & & & 1 & -8 & 19 & -12 \\ \hline & 1 & -8 & 19 & -12 & & \boxed{0} \end{array}$$

$$\begin{array}{r|rrr} \text{III} & 1 & -8 & 19 & -12 \\ & & & 1 & -7 & 12 \\ \hline & 1 & -7 & 12 & & \boxed{0} \end{array}$$

$$(x-1)^3 (x^2 - 7x + 12) = \underline{(x-1)^3 (x-3)(x-4)}$$