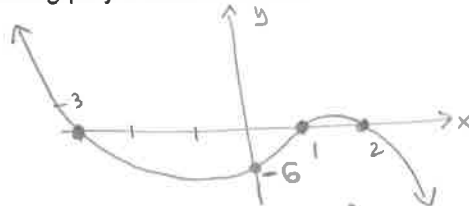


9.3 Polynomial Functions in Factored Form (Class Work)

1. Sketch the graph of the following polynomial functions.

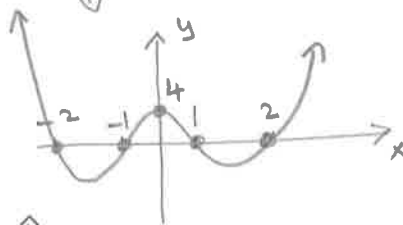
a) $f(x) = (2-x)(x+3)(x-1)$



b) $f(x) = x^4 - 5x^2 + 4$

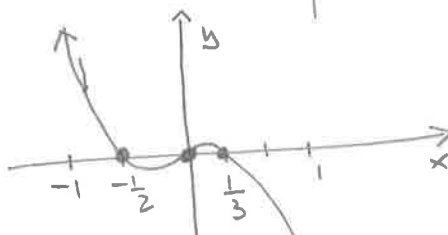
$$= (x^2 - 1)(x^2 - 4)$$

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



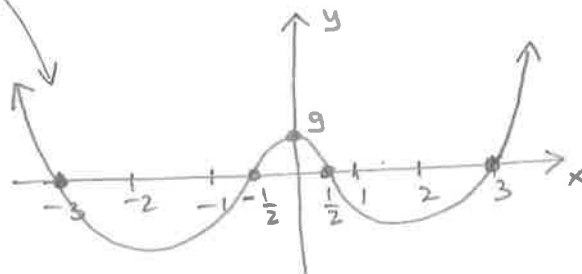
c) $f(x) = x(2x+1)(1-3x)$

$$= -6x(x + \frac{1}{2})(x - \frac{1}{3})$$



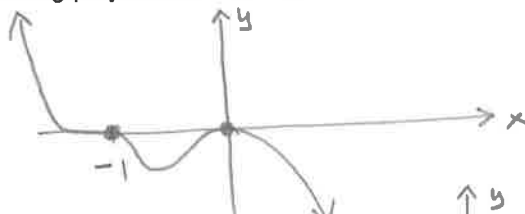
d) $f(x) = (1-4x^2)(9-x^2)$

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



2. Sketch the graph of the following polynomial functions.

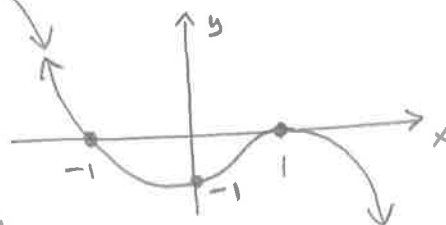
a) $f(x) = -2x^2(x+1)^3$



b) $f(x) = (1-x)(x^2-1)$

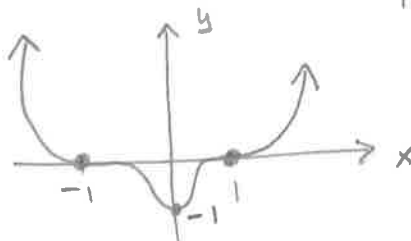
$$= (1-x)(x-1)(x+1)$$

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



c) $f(x) = (x^2-1)^3$

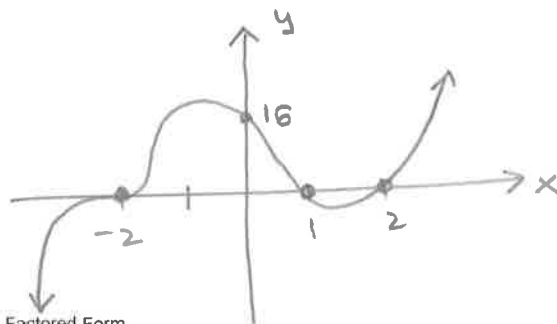
$$= (x-1)^3(x+1)^3$$



d) $f(x) = (x+2)(x^2+x-2)(x^2-4)$

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

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



3. Find the equation of a polynomial function with the following zeros: 2 (simple zero), -1 (multiplicity 3), and 0 (multiplicity 2) such that $f(1) = 2$. Graph this function.

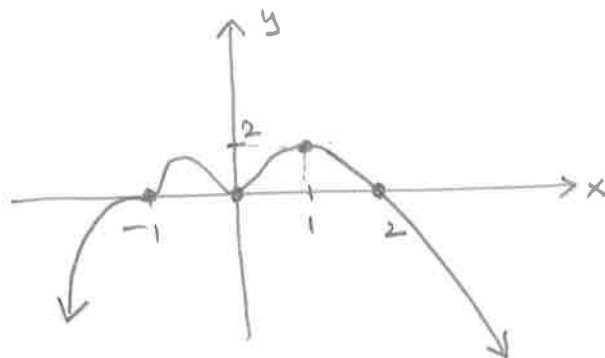
$$f(x) = a x^2 (x-2) (x+1)^3$$

$$f(1) = 2$$

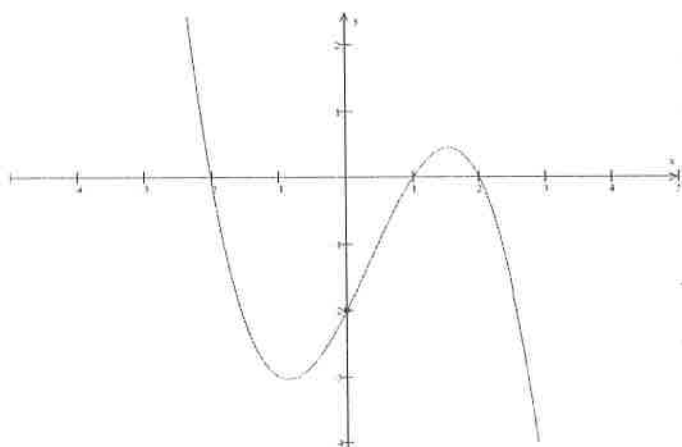
$$a(-1)(8) = 2$$

$$a = -\frac{1}{4}$$

$$\therefore f(x) = -\frac{1}{4} x^2 (x-2) (x+1)^3$$



4. Find the equation of each polynomial function given below graphically.



a)

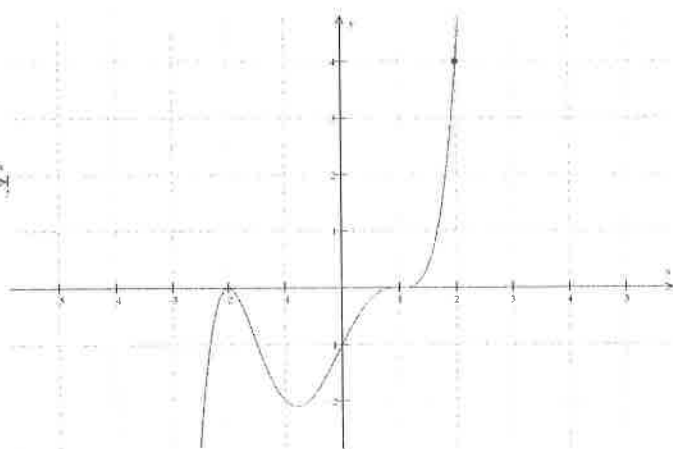
$$f(x) = a(x+2)(x-1)(x-2)$$

$$-2 = f(0)$$

$$-2 = a(2)(-1)(-2)$$

$$a = -\frac{1}{2}$$

$$\therefore f(x) = -\frac{1}{2}(x^2-4)(x-1)$$



b)

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

$$-1 = f(0) \quad \text{or} \quad 4 = f(2)$$

$$-1 = a(4)(-1)$$

$$a = \frac{1}{4}$$

$$\therefore f(x) = \frac{1}{4}(x+2)^2(x-1)^3$$

5. Find a polynomial function satisfying the following table of values. Is the solution unique? Explain.

x	y	Δ^1	Δ^2	Δ^3
-2	0	+8		
-1	8	-4	-12	
0	4	-4	0	12
1	0			

Δ^2 are not constant $\Rightarrow n \neq 2$

$$f(x) = a(x+2)^2(x-1)$$

$$f(-1) = 8$$

$$a(-2)^2 = 8$$

$$a = -\frac{1}{4}$$

$$f(x) = -\frac{1}{4}(x+2)^2(x-1)$$

$$f(0) = 4 \quad \text{not true}$$

reject

$$\text{or } f(x) = a(x+2)(x-1)^2$$

$$f(-1) = 8$$

$$a(1)(4) = 8 \Rightarrow a = 2$$

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

$$f(0) = 4 \quad \text{true}$$

$$\therefore f(x) = 2(x+2)(x-1)^2$$