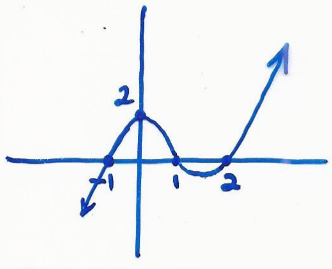
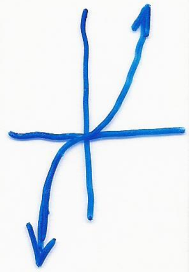
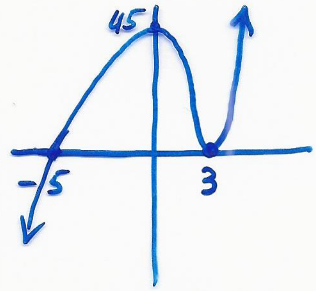
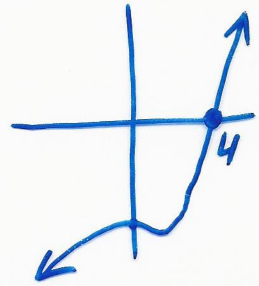
Cubic Function

standard form: $f(x) = ax^3 + bx^2 + cx + d$

1, 2, or 3 real roots

factored form: $f(x) = k(x - s)(x - t)(x - u)$

Function	$f(x) = x^3 - 2x^2 - x + 2$ $f(x) = (x+1)(x-1)(x-2)$ If $f(x) = 0$, $x = -1, 1, 2$	$f(x) = x^3$ $y = (x-0)^3$	$f(x) = x^3 - x^2 - 21x + 45$ $f(x) = (x+5)(x-3)^2$ 2 distinct zeroes	$f(x) = x^3 - 10x - 24$ $f(x) = (x-4)(x^2 + 4x + 6)$ $x^2 + 4x + 6 \neq 0$
Sketch	 degree = 3 $a = 1 > 0$		 	one root 
number of x intercepts	3 x-intercepts $x = -1, 1, 2$	1 x-intercept $x = 0$	2 distinct x-intercepts	1 x-intercept $x = 4$
Type of roots of the related equation, $f(x) = 0$	3 real distinct roots! $0 = (x+1)(x-1)(x-2)$ $x+1=0$ or $x-1=0$ or $x-2=0$ $x=-1$, $x=1$ or $x=2$ Remark: A function retains its sign (positive or negative) on	$f(x) = 0$ $0 = x^3$ $0 = (x-0)(x-0)(x-0)$ 0 is a root of order 3.	$0 = (x+5)(x-3)(x-3)$ $x = -5$, $x = 3$ 3 is a zero of order 2.	$0 = (x-4)(x^2+4x+6)$ $x - 4 = 0$ or $x^2 + 4x + 6 = 0$ $x = 4$ ← one real root or $x_{1,2} = \frac{-4 \pm \sqrt{16-24}}{2}$ $x_{1,2} = \frac{-4 \pm \sqrt{-8}}{2}$ $x_{1,2} = \frac{-4 \pm 2\sqrt{2}i}{2}$ $x_{1,2} = -2 \pm \sqrt{2}i$

the interval b/n any two consecutive x-intercepts.

one pair of complex conjugate roots.