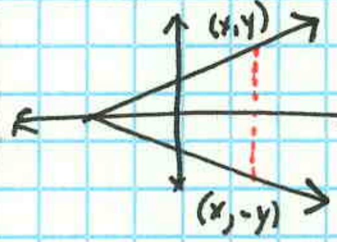
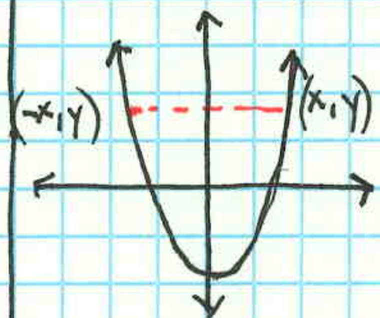
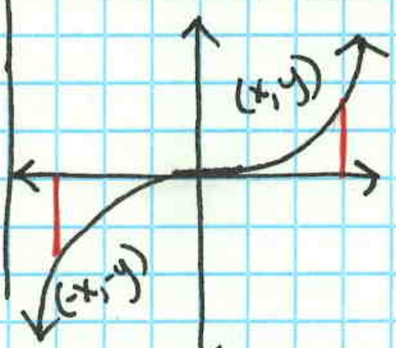
1.2 b Notes

Line Symmetry (Reflectional)

Point Symmetry (180° rotational)

Testing for Symmetry

Graphical	Model	Algebraically
Symmetry on x axis every $(x,y) \to (x,-y)$		Replace y with −y produces equivalent equation
Symmetry on y axis every $(x,y) \to (-x,y)$		Replace x with −x produces equivalent equation $f(x) \to f(-x)$ EVEN
Point Symmetry about the origin every $(x,y) \to (-x,-y)$		Replace x & y with −x & −y produce equivalent equation $f(-x) = -f(x)$ odd $\quad -y$

functions can have y-axis or origin symmetry

Even function → y-axis symmetry $f(-x) = f(x)$

Odd function → origin symmetry $f(-x) = -f(x)$

Ex 4 x-intercept (ROOT, ZEROS, SOLUTIONS)

Find x-intercepts of

$$f(x) = 2x^2 + x - 15$$

$$0 = 2x^2 + x - 15$$

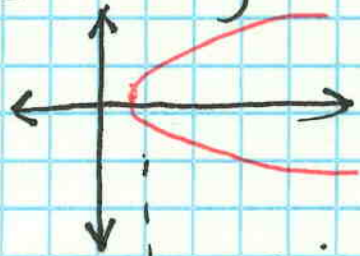
$$= (2x - 5)(x + 3)$$

x-intercepts $= +\frac{5}{2}$ or -3

Ex 5 Test for Symmetry

Algebraically

* $x - y^2 = 1$



x-axis sym

$y \to -y$

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

$x - y^2 = 1$

yes, sym over x

y-axis

$x \to -x$

$-x - y^2 = 1$

no, not over y-axis

origin

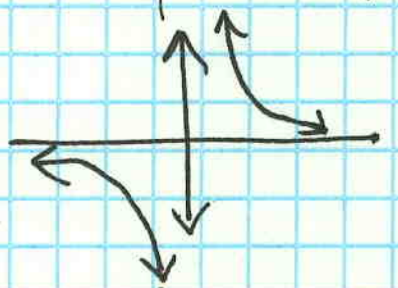
$(x, y) \to (-x, -y)$

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

$-x - y^2 = 1$

no point sym.

* $xy = 5$



N N Y

x axis

$y \to -y$

$x(-y) = 5$

$-xy = 5$

No x Axis sym

y-axis

$x \to -x$

$-xy = 5$

no y-axis sym

origin

$(-x)(-y) = 5$

$xy = 5$

yes - point sym

Ex 6. Symmetry in Functions

EVEN / ODD * hint → highest power

* Must be a function

* must be either symmetricue around y-axis -or- 180° symmetry about the origin.

EVEN → y-axis symmetry
(even power)

test $f(-x) = f(x)$

ODD → point symmetry on origin

test $f(-x) = -f(x)$

* $f(x) = x^3 + 2x$ $-f(x) = -x^3 - 2x$

step 1: evaluate $f(-x)$

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

equivalent functions

$\therefore$ f(x) is odd

* $f(x) = x^4 + 2$

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

$f(-x) = f(x) \therefore f(x)$ EVEN