Mathematical Methods

Outcome 1- Graphs & Functions

Matrices: set out simultaneous equations to find the determinant of the matrix, which is used to find the solution(s) of the equations

e.g. (m-2)x+y=2 and mx+2y=k

$\begin{bmatrix} m-2 & 1 \\ m & 2 \end{bmatrix}$ det=0

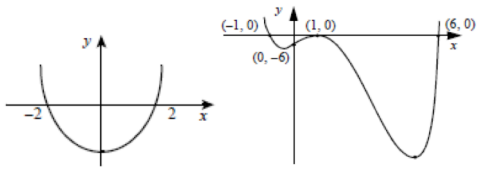
2(m-2)-m(1)=0

Solve for m and m=4

Tips:

1. If m≠4, the equation has a unique solutions as det≠0
2. If m=4 and k≠4, the equation has no unique solutions as det=0 and the 2 parallel lines have no intersection
3. If m=4 and k=4, the equation has infinite solutions as det=0 and the 2 lines are the exact same

Functions: For every "y value", there is only ONE "x value)



Domain and range can come into two notations, set notation and interval notation

e.g. the set R\{2} can be expressed as: (-∞,2) ∪ (2,∞)

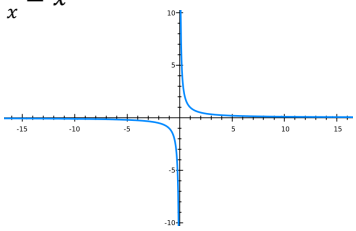
Tips:

1. Use a sliding vertical line as a test for a function
2. Remember to find the implied domain when the rule for a function is given

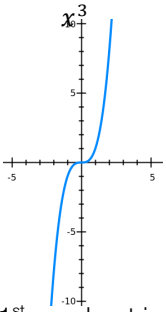
Sketching x^n graphs

If n is odd, the section in the 1st quadrant is rotated into the 3rd quadrant

$\frac{1}{x} = x^{-1}$

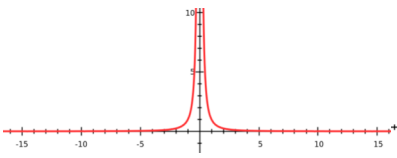


x^3

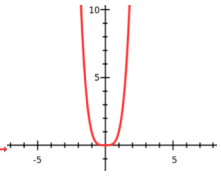


If n is even, then the section in the 1st quadrant is reflected into the 2nd quadrant

$\frac{1}{x^2} = x^{-2}$



x^4



Transformation

1. **Dilation**: stretch the graph from the axis

y=a*f*(x) means y=*f*(x) has been dilated by a factor of "a" from x-axis

y=*f*(ax) means y=*f*(x) has been dilated y a factor $\frac{1}{a}$ from the y-axis

2. **Reflection**: reflecting the graph in the axis

y=-*f*(x) means y=*f*(x) has been reflected in the x-axis

y= y=*f*(-x) means y=*f*(x) has been reflected in the y-xis

3. **Translation**: shifting the graph along the axis

y=*f*(x-a) means y=*f*(x) has been translated "a" units to the right (in the x-axis)

y=*f*(x)+a means y=*f*(x) has been translated "a" units up (in the y-axis)

Combination of transformations: A*f*(n(x+b))+C

Tips:

1. Remember DRT when stating transformations because order matters!

Inverse functions: the rule for the inverse of a relation is obtained by interchanging x and y

The domain of f^{-1}= range of *f* and the range of f^{-1}= domain *f*

e.g. find the inverse function of *f*: [1,5]->R where *f*(x)=x^2 and range: [1,25]

swap $x=y^2$ and solve for y, therefore, f^{-1}: [1,25]->R where $f^{-1}(x)\sqrt{x}$

Tips:

1. If the question asks for a function, both the rule ad domain must be given