

Functions

The domain is what x can be

The range is what y can be

Inverse Functions

$$f^{-1}(x)$$

To find an inverse function:

1. Switch x and y
2. Rearrange to make y the subject

On a graph it is a reflection in the line $y = x$

Composite Functions

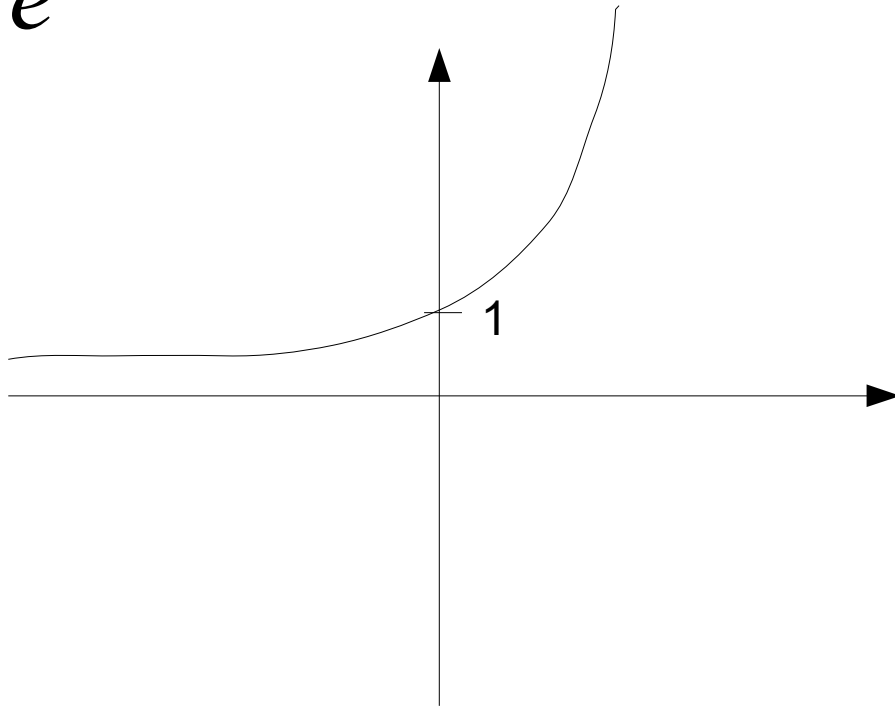
$$f(g(x))$$

$f(g(x))$ means put g into f

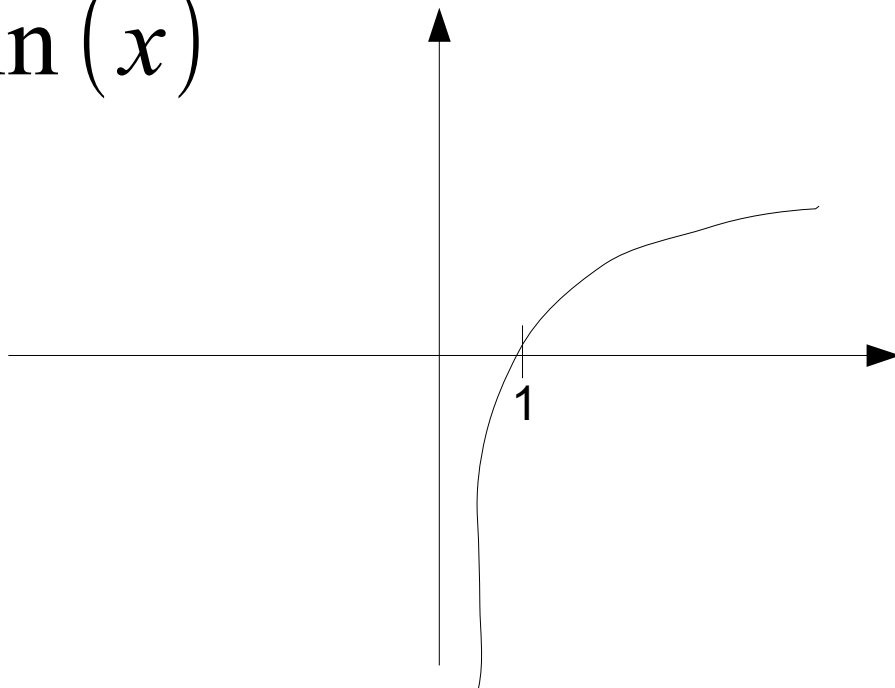
$g(f(x))$ means put f into g

The Exponential and Logs

$$y = e^x$$



$$y = \ln(x)$$



$\ln(x)$ means $\log_e x$

$\ln(x)$ is the inverse of e^x

Iteration

$$U_{n+1} = \sqrt{U_n + 5} \quad U_0 = 2$$

$$U_1 = \sqrt{(2) + 5} = \sqrt{7}$$

$$U_2 = \sqrt{(\sqrt{7}) + 5} = 2.765 (3\text{dp})$$

$$U_3 = \sqrt{(ANS) + 5} = 2.787 (3\text{dp})$$

$$U_4 = \sqrt{(ANS) + 5} = 2.790 (3\text{dp})$$

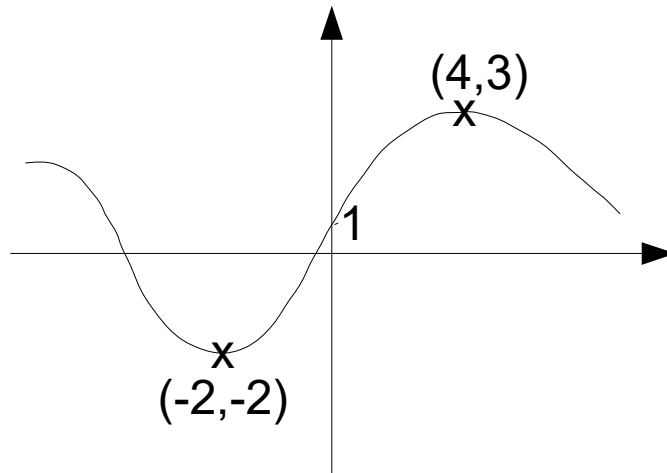
$$U_5 = \sqrt{(ANS) + 5} = 2.791 (3\text{dp})$$

$$U_6 = \sqrt{(ANS) + 5} = 2.791 (3\text{dp})$$

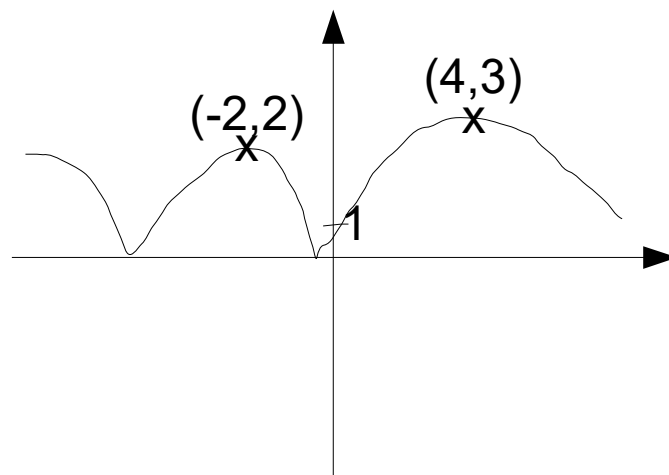
$f(x) = 0$ has a solution between a and b if
 $f(a)$ and $f(b)$ have different signs

Transforming Graphs

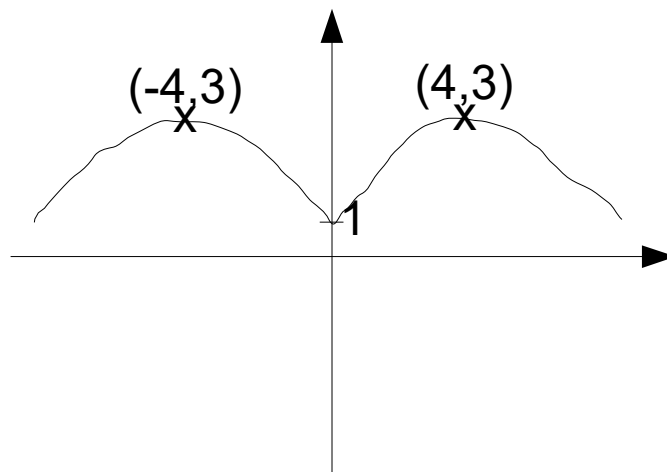
$$y = f(x)$$



$$y = |f(x)|$$



$$y = f(|x|)$$



Trigonometry

$$\frac{1}{\sin(\theta)} = \text{cosec}(\theta)$$

$$\frac{1}{\cos(\theta)} = \text{sec}(\theta)$$

$$\frac{1}{\tan(\theta)} = \text{cot}(\theta)$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

$$1 + \tan^2 \theta = \text{sec}^2 \theta$$

$$1 + \cot^2 \theta = \text{cosec}^2 \theta$$

$$\sin(\theta) = \sin(180 - \theta)$$

$$\cos(\theta) = \cos(360 - \theta)$$

$$\tan(\theta) = \tan(\theta + 180)$$

Trigonometry

In the Formula Book

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

Not in the Formula Book (but you can make them by substituting B for A)

$$\sin(2A) = 2\sin A \cos A$$

$$\cos(2A) = \cos^2 A - \sin^2 A$$

$$\cos(2A) = 2\cos^2 A - 1$$

$$\cos(2A) = 1 - 2\sin^2 A$$

$$\tan(2A) = \frac{2\tan A}{1 - \tan^2 A}$$

To put something in the form

$$R \sin(\theta \pm \alpha) \text{ or } R \cos(\theta \mp \alpha):$$

-Compare to compound angle formula

-Find R using pythagoras: $R^2 = a^2 + b^2$

-Find alpha by dividing sin by cos to get tan

Differentiation

Chain Rule

$$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$$

Product Rule

$$y = uv$$

$$\frac{dy}{dx} = v \frac{du}{dx} + u \frac{dv}{dx}$$

Quotient Rule

$$y = \frac{u}{v}$$

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

Differentiation

| Function | Derivative |
|-----------|---------------|
| e^x | e^x |
| $\ln(x)$ | $\frac{1}{x}$ |
| $\sin(x)$ | $\cos(x)$ |
| $\cos(x)$ | $-\sin(x)$ |