**12B First Principles**

1. A point A with coordinates (4,16) lies on the curve with equation . At point A the curve has gradient .
2. Show that
3. Deduce the value of

**12C General Rules**

1. Find for each of the expressions for to the right.

**12D Multiple terms**

1. Find when
2. Find the gradient of the curve when
3. Find the gradient of the curve at the point

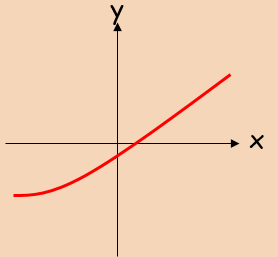
**12E Preparing for Calculus**

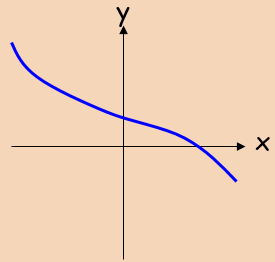
1. Find when
2. Find the gradient of the curve at the point (2,0)

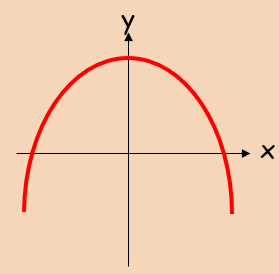
**12F Tangents & Normals**

1. Find the equation of the tangent to the curve y = x3 – 3x2 + 2x - 1, at the point (3,5).
2. Find the equation of the normal to the curve y = 8 - 3√x at the point where x = 4.

**12G Increasing & Decreasing Functions**







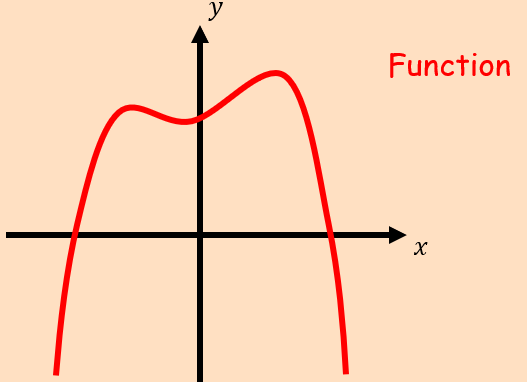
1. Show that the function ;

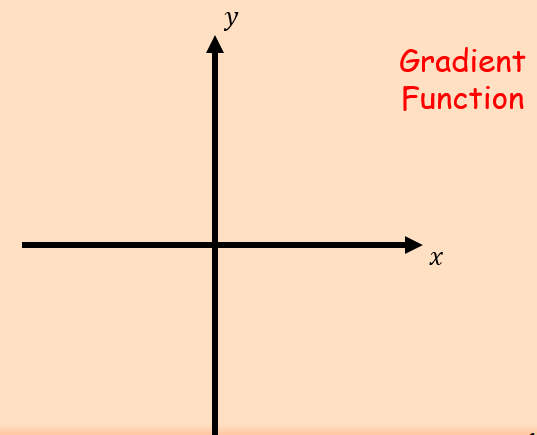
is an increasing function.

1. Find the range of values where:

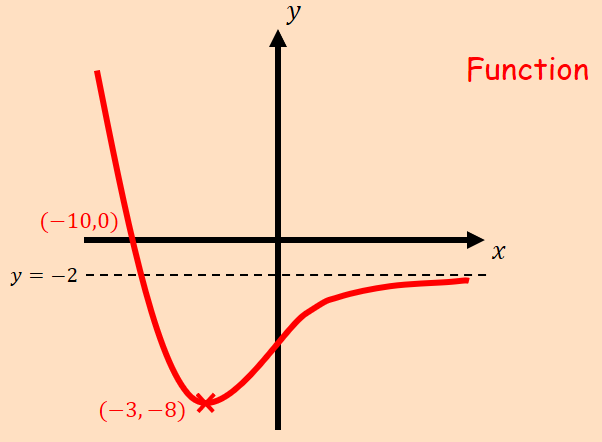
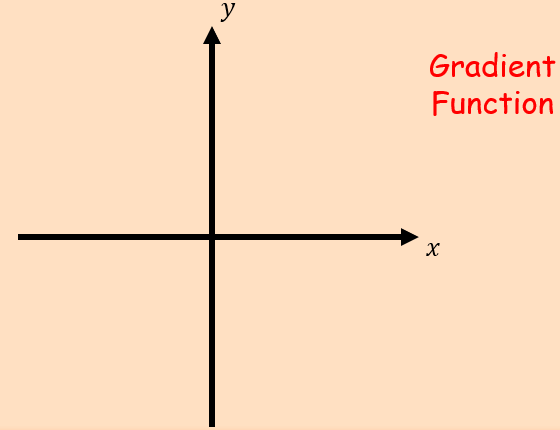
is a decreasing function.

**12J Graphing the Gradient Function**





1. The diagram shows the curve with equation . It has an asymptote at , a turning point at and it cuts the x-axis at
2. Sketch the graph of

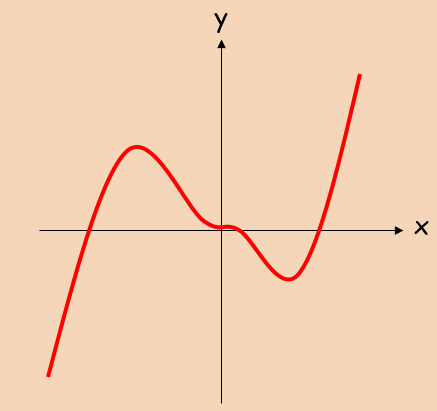
 

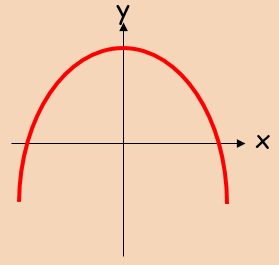
1. State the equation of the asymptote of

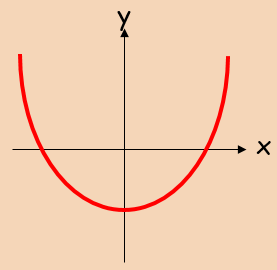
**12H Second Derivatives**

1. Find and of the following:
2. Find and of the following:

**12I Stationary Points**







Note on f’’(x) = 0

1. Find the coordinates of the turning point on the curve y = x4 – 32x, and state whether it is a minimum or maximum.
2. Find the stationary points on the curve: y = 2x3 – 15x2 + 24x + 6, and state whether they are minima, maxima or points of inflexion

**12K Differentiation in Context**

1. Given that the volume, , of an expanding sphere is related to its radius, , by the formula , find the rate of change of volume with respect to radius at the instant when the radius is 5cm.
2. A large tank (shown) is to be made from 54m2 of sheet metal. It has no top.

a) Show that the Volume of the tank will be given by:

b) Find the Maximum volume of the tank