Learning Enhancement Team

University of East Anglia

STUDENT SUPPORT SERVICE

Worksheet: Finding Stationary Points

This worksheet has questions on finding stationary points. The stationary points of a function are important in describing how that function works and finding them is useful if you need to sketch the function or locate where the function changes direction. Before attempting the questions below you should understand what a stationary point is and be able to differentiate basic functions.

Model answers to this sheet

Finding Stationary Points study guide

Differentiating Basic Functions study guide

Stationary Points study guide

1. Find the first derivative of these functions, set the result equal to zero and so find the coordinates of their stationary points.

(a) $y = 3x^2 - 4$

(b) $y = \frac{4}{3}x^3 - x$

(c) $y = 12x^3 - 3$

(d) $y = 4x^4$

(e) $y = \frac{1}{4}x^4 - x^3 + x^2$

2. Differentiate the trigonometric functions $y = \cos\theta$ and $y = 2\sin\theta$ and find their respective stationary points in the range $0 \le \theta \le 2\pi$.

3. Find the second derivative of the functions in questions 1 and 2 and use this result to classify the stationary points as a maximum, minimum or point of inflexion.

4. Differentiate the following functions and find the coordinates of all of their stationary points. Then differentiate again use the second derivative to help you find the nature of the stationary points.

(a) $y = 2x - \frac{1}{6}x^3$

(b) $y = x^9$

(c) $y = x^2 + 3x + 4$

(d) $y = 10x - x^2$

(e) $y = 12(x+1)^3 + 6$

(f) $y = \cos(x) + x$ between $0 \le x \le \pi$

5. "The function $y = e^x$ has no stationary points."
Use the first derivative to make a mathematical argument to support this claim.

Can you think of other functions that do not have any stationary points? Can you use a similar argument to support you claim?