

## CALCULUS 13: QUIZ SOLUTIONS

### Question 1

What are the coordinates of the minimum turning point of the function

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

- A. (2; 0)                      B. (0; 2)                      C. (0; 1)                      D. (1; 0)

### Solution

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

$$f'(x) = 3x^2 - 3 = 0 \text{ for max/min}$$

$$\therefore 3x^2 - 3 = 0$$

$$\therefore 3(x+1)(x-1) = 0$$

and so  $x = 1$  or  $x = -1$

$$f''(1) = 6 > 0, \text{ so this is a minimum}$$

$$f(1) = (1)^3 - 3(1) + 2 = 0$$

The coordinates of the minimum point are (1; 0).

So, the correct answer is D.

### Question 2

What are the coordinates of the maximum turning point of the function

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

- A. (-1; 4)                      B. (4; -1)                      C. (0; 2)                      D. (1; 0)

### Solution

From Question 1 Solution:

$$f''(-1) = -6 < 0, \text{ so this is a maximum}$$

$$f(-1) = (-1)^3 - 3(-1) + 2 = 4$$

The coordinates of the maximum point are (-1; 4).

So, the correct answer is A.

### Question 3

What are the coordinates of the point of inflection of the function  $f(x) = x^3 - 3x + 2$  ?

- A. (2; 0)                      B. (0; 2)                      C. (1; 0)                      D. (-1; 4)

### Solution

From Question 1 Solution:

$$f''(x) = 6x = 0, \text{ for a point of inflection}$$

$$\text{and } f(0) = 0 - 0 + 2 = 2$$

The coordinates of the point of inflection are (0; 2).

So, the correct answer is B.

**Question 4**

For which interval is the function  $f(x) = x^3 - 3x + 2$  concave up?

- A.  $-\infty < x < 0$       B.  $-2 < x < 1$       C.  $0 < x < \infty$       D.  $-1 < x < 1$

**Solution**

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

$$\therefore f'(x) = 3x^2 - 3$$

$$\therefore f''(x) = 6x$$

$f(x)$  is concave up when  $f''(x) > 0$

and  $f''(x) > 0$  when  $x > 0$

So, the correct answer is C.

**Question 5**

For which interval is the function  $f(x) = x^3 - 3x + 2$  concave down?

- A.  $0 < x < \infty$       B.  $-\infty < x < 0$       C.  $-1 < x < 1$       D.  $-2 < x < 1$

**Solution**

From Question 4 Solution:

$$f''(x) = 6x$$

$f(x)$  is concave down when  $f''(x) < 0$

and  $f''(x) < 0$  when  $x < 0$

So, the correct answer is B.