2007 Form B AB4

Information about f ' and f ".

x	-5<x<-3	-3<x<1	1<x<4	4<x<5
f '	positive	negative	positive	Negative
f	increasing	decreasing	increasing	decreasing

x	-5<x<-4	-4<x<-3	-3<x<-1	-1<x<1	a<x<2	2<x<5
f "	positive	negative	negative	positive	positive	negative
f	ccu	ccd	ccd	ccu	ccu	ccd

A.

The function f has a relative maximum at x = -3 and at x = 4 because it is at x = -3 that the function changes from increasing to decreasing (because the derivative of f changes from positive to negative.)

B. There are three points of inflection. The occur at x = -4, -1, and 2. This is because the second derivative of f changes sign at these locations.

C. The function f is concave up and has positive slope for -5<x<-4 and 1<x<2 because f " has a positive value and f ' has a positive value.

D. There are two candidates for the absolute minimum. They are x = -5 and +1. We know that f(1) = 3. Starting at x = -5 the function f increases until x = -3 by a value equal to the area of the semi-circle with radius 1 or π. Then the function f decrease between -3<x<-1. The decrease in the value of the function equal the area of the semi-circle with a radius of 2 or 2π. (After x>1 the function increases so there are no other candidates for the absolute minimum.) Therefore the absolute minimum is at x = 1

Summary : f (-5) = C, f (-3) = $C+\pi$, f(1) = $C-\pi$. Therefore the absolute minimum occurs at x = 1.

Alternately: We know that f(1)=3. By the accumulation function we know that $f(-3)=3+2\pi$ and $f(-5)=3-\frac{\pi}{2}+2\pi=3+\frac{3}{2}\pi$. Therefore the minimum value of the function is 3.