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Using the Fundamental Theorem of Calculus

Area

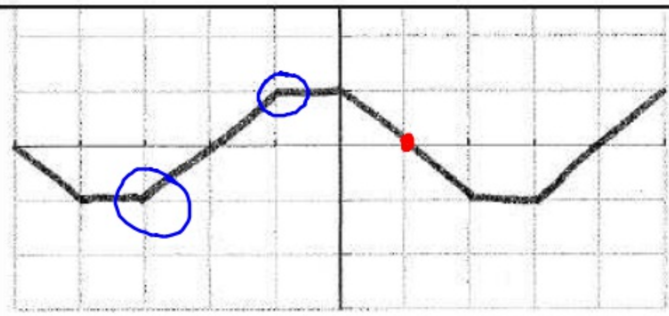
$g(x)=\int_{-2}^{x} f(t)\,dt$

Look for the y-coordinate

$g'(x)=f(x)$

Look at the slope of given graph

$g''(x)=f'(x)$



Graph of $f(t)$ $f(t)$

Given: $g(x)=\int_{-2}^{x} f(t)dt$. Find each of the following:

1. $g(4) = \int_{-2}^{4} f(t)\,dt = 0$

The actual coordinate of g(x) at x=4 is y=0.

2. $g'(1) = f(1) = 0$

The slope of g(x) at x=1 is zero.

3. $g''(-1) = f'(-1) =$ undefined

4. $g''(-3) = f'(-3) =$ undefined

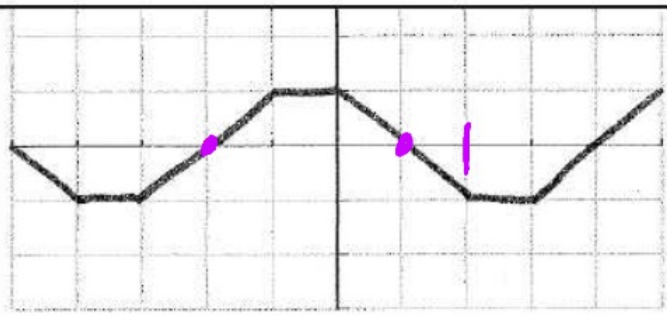
x=-1 and x=-3 are possible inflection points on the graph of g(x)

5. $g'(0) = f(0) = 1$

6. $g(1) = \int_{-2}^{1} f(t)\,dt = 2$

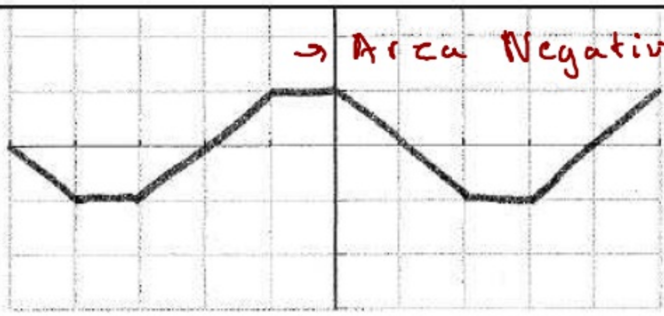
7. $g(-3) = \int_{-2}^{-3} f(t) = .5$

8. $g(-4) = \int_{-2}^{4} f(t)\,dt = 1.5$

$g(x)=\int_{-2}^{x} f(t)\,dt$ $g'(x)=f(x)$	 Graph of $f(t)$
	9. Find the equation of the tangent line to the graph of g at x = -2 $g(-2)=\int_{-2}^{-2} f(t)\,dt=0$ point $(-2,0)$ $g'(-2)=f(-2)=0$ $m=0$ $y=0+0(x+2)$ $y=0$
$g'(x)=f(x)$ $g''(x)=f'(x)$	10. Determine any relative/local maxima or minima on the interval (-5,2) of $g(x)$ $g'(x)=0$ Critical Points $x=-2,1$ $g''(-2)=1>0$ $x=-2$ local min $g''(1)=-1<0$ $x=1$ local max
	11. Determine the absolute maximum and minimum of g on [-5, 2]. Plug C.P. and endpoints into $g(x)$ $g(-5)=\int_{-2}^{-5} f(t)=2$ $g(1)=\int_{-2}^{1} f(t)\,dt=2$ $g(-2)=\int_{-2}^{-2} f(t)\,dt=0$ $g(2)=\int_{-2}^{2} f(t)\,dt=1.5$

g(x) inc → $\boxed{g'(x) > 0}$ → Area Positive

g(x) dec → Area Negative



Graph of $f(t)$

11. Let $\boxed{h(x) = g(x) - .5x^2 - x.}$ Determine the critical values of h(x) on $-5 < x < 5$.

$x = 0$

$h(x) = g(x) - .5x^2 - x$

$h'(x) = g'(x) - x - 1$

$0 = g'(x) - x - 1$

$x + 1 = g'(x)$ ⟶ when is $f(x)$ $x+1$?

↑ The y value is 1 more than x

12. Let $n(x) = [g(x)]^2 + f(x)$. Find $n'(1) =$

$\int_{-2}^{1} f(t) = 2$

$n'(x) = 2[g(x)] \cdot g'(x) + f'(x)$

$n'(1) = 2(g(1)) \cdot g'(1) + f'(1)$

Area, y-coord at x=1, slope of f(x) at x=1

$2(2)\,(0) + (-1)$

$n'(1) = -1$