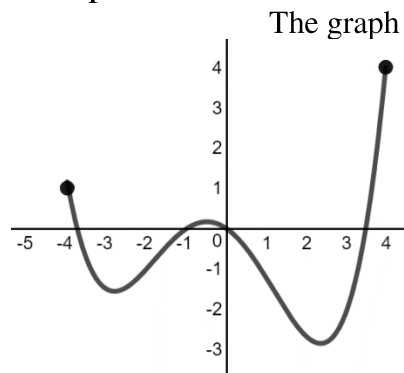


**Example 1: Extreme Values / Exploring Accumulations of Change**

The graph of a differentiable function  $h(x)$  is shown below on the closed interval  $[-4, 4]$ .

The function  $h(x)$  has  $x$ -intercepts on the interval  $[-4, 4]$  at  $x = -3.8$ ,  $x = -1$ ,  $x = 0$ , and  $x = 3.4$ . Also,  $h(x)$  has horizontal tangents at  $x = -2.9$ ,  $x = -0.5$ , and  $x = 2.2$ . The areas of the regions bounded by the  $x$ -axis and the graph of  $h(x)$  on the intervals  $[-1, 0]$ ,  $[0, 3.4]$  and  $[3.4, 4]$  are 0.3, 12, and 2, respectively.

$$\text{For all } x, g(x) = 11 + \int_0^x h(t) dt.$$

(a) Find:  $g(3.4)$        $g(4)$        $g(-1)$        $g'(3.4)$        $g''(2.2)$

(b) Find the maximum and minimum of  $g(x)$  on the interval  $[-1, 4]$ . Explain your answers.

**Example 2: Approximating areas with Riemann Sums**

Little is known about the function  $v(t)$  except selected values given in the table. Use a \_\_\_\_\_ sum with the four sub intervals indicated by the data in the table to approximate  $\int_{-2}^{10} v(t) dt$ .

|        |    |   |    |   |    |
|--------|----|---|----|---|----|
| $t$    | -2 | 1 | 6  | 7 | 10 |
| $v(t)$ | 3  | 4 | -9 | 2 | 0  |

(a) left Riemann

(b) right Riemann

(c) trapezoidal

Note: We did an example of a midpoint sum in one of the Unit 8 videos. ☺

**Example 3: Fundamental Theorem of Calculus**

(a)  $\int_4^9 \frac{1}{2\sqrt{x}} dx =$

(b)  $\frac{d}{dx} \left[ \int_a^{x^3} \frac{1}{t^2 + t - 5} dt \right] =$

**Example 4: Properties of Definite Integrals**

Given  $\int_3^6 f(x) dx = 7.5$ ,  $\int_5^3 f(x) dx = 2$ , and  $\int_6^3 g(x) dx = -12$ , determine:

(a)  $\int_5^6 f(x) dx$

(b)  $\int_3^6 g(x) dx$

(c)  $\int_3^6 [4f(x) - 2g(x) + 4] dx$

**Example 5: Integration Blast! (Separate paper probably required!)**

(a)  $\int \sin \theta d\theta$

(b)  $\int \frac{1-x}{1+x^2} dx$

(c)  $\int \frac{1}{(2-G)^{2/3}} dG$

(d)  $\int_{-5}^5 \sqrt{25-x^2} dx$

Remember: What's the integral of  $\frac{1}{cabin}$  with respect to *cabin*? House Boat!