

Name: Key

**CALCULATORS ALLOWED**

1. [15 points] Graph  $f(x) = \int_0^x g(t) dt$ , where  $g(t)$  is given by the graph below and answer these questions.

On the interval  $(4, 6)$  is your graph is concave up or concave down?

- What is  $f(6)$ ? *12*  
 What is  $f'(2)$ ? *undefined*  
 What is  $f'(5)$ ? *2*  
 What is  $f''(5)$ ? *1*

- f(0) = 0*  
*f(1) = 3*  
*f(2) = 6*  
*f(3) = 7*  
*f(4) = 8*  
*f(5) = 9.5*  
*f(6) = 12*

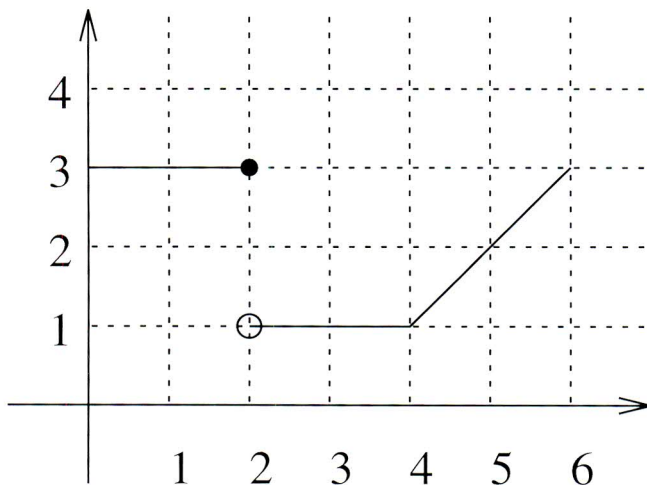
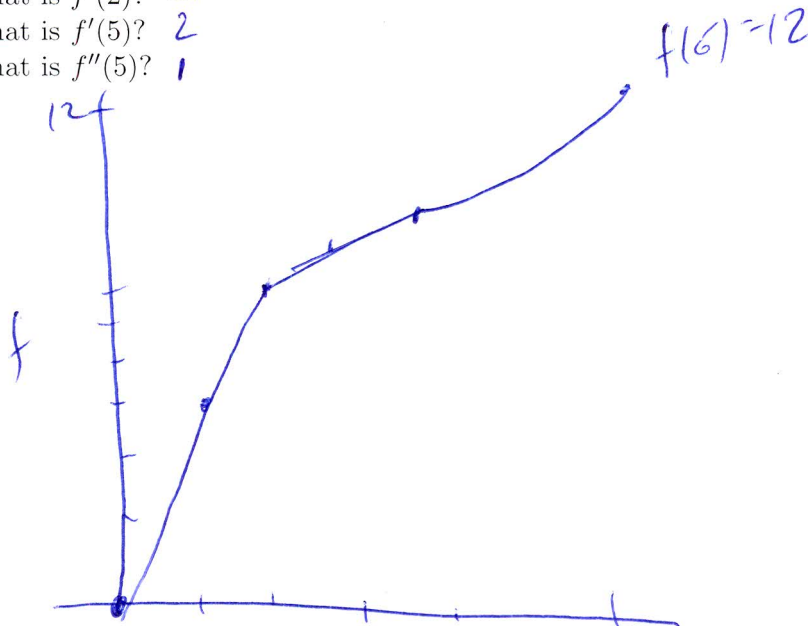


Figure 1: Graph of  $g(t)$

$$\left[ \ln\left(1\frac{1}{3}\right) + \ln\left(1\frac{2}{3}\right) + \ln(2) + \ln\left(2\frac{1}{3}\right) + \ln\left(2\frac{2}{3}\right) + \ln 3 \right] \frac{1}{3}$$

$x_0 \quad x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6$

$$\frac{4.418394279\dots}{3} = 1.472798093\dots$$

$\approx 1.473$

3. [5 points] Let  $h(x) = \int_0^{x^3} \sin(t^2) dt$ . Find  $\frac{dh}{dx}$ .

$$h(x) = F(x^3) - F(0) \quad \text{where } F'(t) = \sin(t^2)$$

$$\frac{dh}{dx} = F'(x^3) \cdot (3x^2) - 0$$

$$= \sin(x^6) \cdot 3x^2$$

4. [5 points] Compute  $\int x^4 + \sqrt{x} + \frac{1}{x^2} + 2^x + \sinh x \, dx$

$$\frac{x^5}{5} + \frac{2}{3}x^{\frac{3}{2}} + \frac{1}{x} + \frac{2^x}{\ln 2} + \cosh x + C$$