

Name : \_\_\_\_\_

**TO RECEIVE FULL CREDIT YOU MUST SHOW ALL YOUR WORK.**

1. Use the limit definition to find the derivative of  $f(x) = x^2 + 9x$ .

2. Let  $f(x)$  be the function whose graph is shown in Figure 1. Show that  $f'(5)$  does not exist.

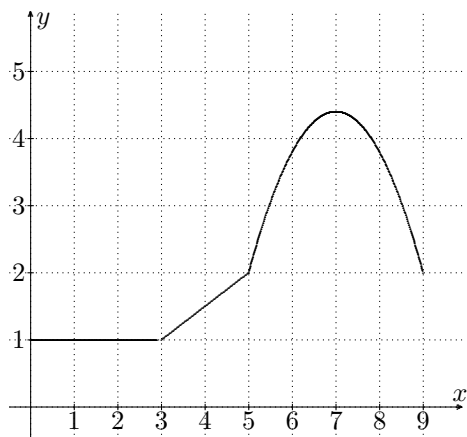


Figure 1: Graph of  $f(x)$

3. At what rate is the cube root  $\sqrt[3]{x}$  changing with respect to  $x$  when  $x = 27$ ?

4. Figure 2 shows  $f$ ,  $f'$  and  $f''$ . Determine which is which.

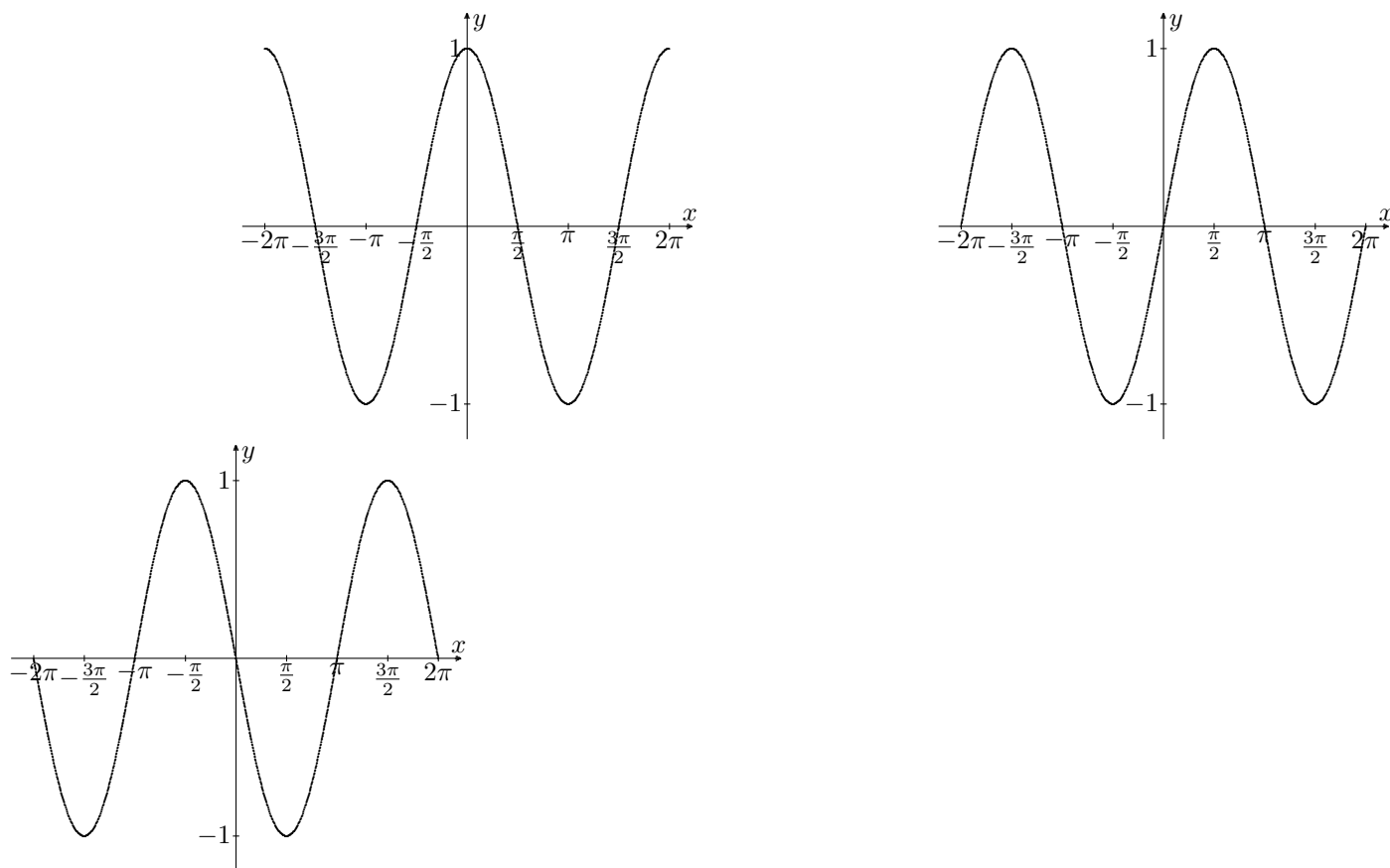


Figure 2:

5. Calculate the second and third derivatives of the function  $y = e^x \cos x$ .

6. Calculate the derivative of the following functions:

- $g(z) = 7z^{-3} + z^2 + 5$

- $f(s) = \sqrt[4]{s} + \sqrt[3]{s}$

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

- $h(x) = (x^{3/2})(2x^4 - 3x + x^{-1/2})$

- $h(t) = \frac{t^3 + 1}{t^4 + t^2}$

7. Compute the derivative of the functions:

- $f(\theta) = e^{-\theta} \cos^2 \theta$

- $h(x) = \frac{x}{\sin x + 2}$

- $y = (\sqrt{x+1} - 1)^{3/2}$

- $y = \sqrt{\sqrt{x+1} + 1}$

- $y = \cos(te^{-2t})$

- $y = \tan(e^{5-6x})$