

1 Evaluate

$$\lim_{x \rightarrow 4} \left(\frac{x^2 - 16}{x - 4} \right).$$

2 Evaluate

$$\lim_{y \rightarrow -\infty} (y^3 + 5).$$

3 Evaluate

$$\lim_{x \rightarrow 2^+} \left(\frac{x^2 - 2}{x - 2} \right).$$

4 Evaluate

$$\lim_{t \rightarrow \infty} (t^{1/t^2}).$$

5 Given

$$f(x) = x^2,$$

use the definition of the derivative as a limit to calculate $f'(3)$.

6 Given

$$y = 3(x - 4)^2,$$

find the derivative of y with respect to x .

7 Given

$$x = \sqrt{t^2 - 1},$$

find the derivative of x with respect to t .

8 Given

$$5x + 6y = x^5 + y^2,$$

find the derivative of y with respect to x .

9 Given

$$p = e^q \ln q,$$

find the derivative of p with respect to q .

10 Given

$$y = \frac{\cos x}{\arctan x},$$

find the derivative of y with respect to x .

11 Given

$$g(x) = \frac{x+4}{x-1},$$

find g' .

12 Given

$$f(x) = 4x^3 + 2x^2,$$

find f'' .

13 Given

$$g(x) = \sqrt{400 - x^2},$$

find the maximum and minimum values of g , if they exist.

14 Given

$$f(x) = x^4 + 20x^3 + 100x^2,$$

sketch a graph of f .

15 Find the sum

$$\sum_{i=1}^{100} i^2.$$

16 Find the value of

$$\int_0^4 (2x^3 + 3x^2 - 5) dx.$$

17 Given

$$f(x) = x\sqrt{x^2 + 1},$$

find the antiderivatives (indefinite integrals) of f .

18 Find the value of

$$\int_1^4 \left(\frac{1}{x+1} + e^{2x} \right) dx.$$

19 Find the area bounded by the graphs of these equations:

$$y = x^3,$$
$$y = x^2.$$

20 Set up an integral whose value is the length of the curve with equation

$$y = 2\sqrt{1-x^2}$$

from $(x, y) = (0, 2)$ to $(x, y) = (1, 0)$.

- 21** The population of a certain city is given approximately by

$$C = 3t^2 + 1,$$

where C is the city's population in thousands and t is the time in years since the city was founded. Five years after the city was founded, how fast (at what rate) is its population growing?

- 22** Refer to the previous question. The population of the city's metropolitan area is given approximately by

$$M = C + \frac{1}{8}tC,$$

where M is the metropolitan population in thousands. Five years after the city was founded, how fast is the population of its metropolitan area growing?

- 23** Suppose that a ball thrown into the air has its height given by

$$h = 6 + 5t - 16t^2,$$

where h is its height in feet and t is the time in seconds since it was thrown (at least when h is positive). How long after it was thrown is it at its maximum height?

- 24** Refer to the previous question. What is the ball's maximum height?

- 25** Refer to the previous questions. What is the ball's minimum height?