1 Evaluate

$$\lim_{x \to -3^-} \left(\frac{x^2 + 3}{x + 3} \right).$$

- a. 6
- b. ∞
- c. −∞
- d. undefined
- 2 Evaluate

$$\lim_{x \to -\infty} \left(x^4 + 5x^2 \right).$$

- a. 24
- b. ∞
- c. $-\infty$
- d. undefined
- 3 Evaluate

$$\lim_{x \to 6} \left(\frac{x^2 - 36}{x - 6} \right).$$

- a. 12
- b. ∞
- c. −∞
- d. undefined
- 4 Evaluate

$$\lim_{t\to 0}\frac{3t\sin t}{\cos\left(2t\right)-1}.$$

- a. $-\frac{3}{2}$
- b. 0c. $\frac{3}{2}$
- d. undefined
- 5 Given

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

use the definition of the derivative as a limit to calculate f'(1).

- a. $\lim_{h \to 0} (6 + 2h) = 6$
- b. $\lim_{h \to 0} (6+h) = 6$
- c. $\lim_{h \to 0} (6+3h) = 6$
- d. $\lim_{h \to 0} (6 + 6h) = 6$

6 Given

$$y = \sqrt{3x^2 + 4}.$$

find the derivative of y with respect to x.

a.
$$\frac{dy}{dx} = \frac{\sqrt{3x^2 + 4}}{2} = \frac{1}{2}(3x^2 + 4)^{1/2}$$

b.
$$\frac{dy}{dx} = 3x\sqrt{3x^2 + 4} = 3x(3x^2 + 4)^{1/2}$$

c.
$$\frac{dy}{dx} = \frac{3x\sqrt{3x^2+4}}{3x^2+4} = 3x(3x^2+4)^{-1/2}$$

d.
$$\frac{dy}{dx} = \frac{\sqrt{3x^2 + 4}}{2(3x^2 + 4)} = \frac{1}{2}(3x^2 + 4)^{-1/2}$$

7 Given

$$3x + 4y = x^2 + y^3,$$

find the differential of y in terms of the differential of x.

a.
$$dy = -\frac{(2x-3) dx}{3y^2 - 4} = -\frac{2x-3}{3y^2 - 4} dx$$

b.
$$dy = \frac{(3y^2 + 2x) dx}{7} = \frac{3y^2 + 2x}{7} dx$$

c.
$$dy = \frac{(3y^2 + 2x - 3) dx}{4} = \frac{3y^2 + 2x - 3}{4} dx$$

d.
$$dy = -\frac{(2x-3) dx}{3y-4} = -\frac{2x-3}{3y-4} dx$$

8 Given

$$x = te^{2t}$$

find the derivative of x with respect to t.

a.
$$2e^{2t}$$

b.
$$e^{2t} + te^{2t} = (t+1)e^{2t}$$

c.
$$2te^{2t}$$

d.
$$e^{2t} + 2te^{2t} = (2t+1)e^{2t}$$

9 Given

$$p = \arctan(q^2) + \cos(3q) = \tan^{-1}(q^2) + \cos(3q),$$

find the derivative of p with respect to q.

a.
$$\frac{2q}{\sqrt{1-q^4}} - 3\sin(3q)$$

b.
$$\frac{2q}{q^4+1} - 3\sin(3q)$$

c.
$$\frac{2q}{q^4+1} + 3\sin(3q)$$

d.
$$\frac{2q}{\sqrt{1-q^4}} + 3\sin(3q)$$

10 Given

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

find f'.

a.
$$f'(x) = -\frac{5}{(x+1)^2}$$

b.
$$f'(x) = \frac{5}{(x-4)^2}$$

c.
$$f'(x) = -\frac{5}{(x-4)^2}$$

d.
$$f'(x) = \frac{5}{(x+1)^2}$$

11 Given

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

find g''.

a.
$$g''(x) = 12x^2 + 4x$$

b.
$$g''(x) = 24x + 4$$

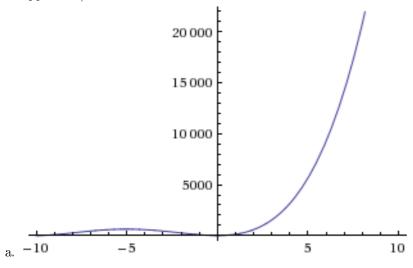
c.
$$g''(x) = 24x^2 + 4x$$

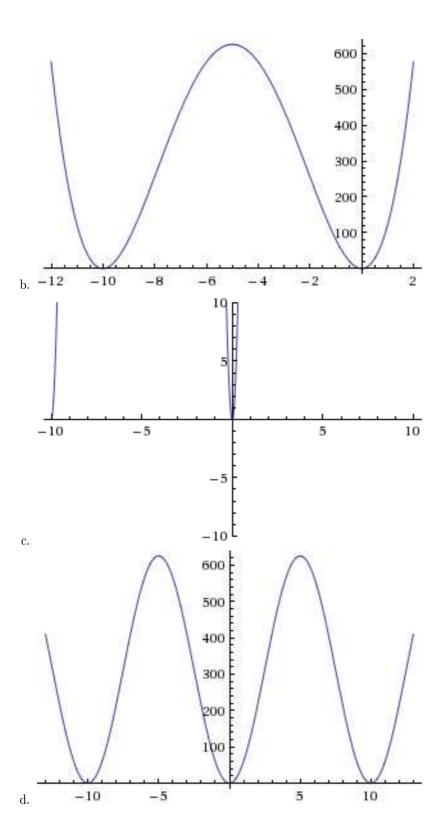
d.
$$g''(x) = 12x + 4$$

12 Given

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

sketch a graph of f that shows all intercepts (if any), all local extrema (if any), and both infinite limits (if applicable).





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13 Given

$$f(x) = \sqrt{100 - x^3},$$

find the maximum and minimum value of f, if they exist.

- a. maximum is 10, minimum is 0
- b. maximum is 10, no minimum
- c. no maximum, minimum is 0
- d. no maximum, no minimum

14 Find the sum

$$\sum_{i=1}^{200} i$$
.

- a. 39,800
- b. 40,200
- c. 20,100
- d. 19,900

15 Find the value of

$$\int_0^1 (4x^3 - 3x^2 + 4x - 2) \, \mathrm{d}x.$$

- a. 4
- b. 2
- c. 0
- d. 3

16 Given

$$f(x) = \frac{1}{x+2} + e^{3x},$$

find the antiderivatives (indefinite integrals) of f.

a.
$$\int f(x) dx = \frac{1}{2} \ln(x+2) + \frac{1}{3} e^{3x} + C$$

b.
$$\int f(x) dx = \ln(x+2) + e^{3x} + C$$

c.
$$\int f(x) dx = \frac{1}{2} \ln(x+2) + e^{3x} + C$$

d.
$$\int f(x) dx = \ln(x+2) + \frac{1}{3}e^{3x} + C$$

17 Find the value of

$$\int_{-2}^{2} x \sqrt{x^2 + 5} \, \mathrm{d}x.$$

a.
$$\frac{4}{3}\sqrt{2} \approx 1.9$$

- b. (
- c. $9 \frac{5}{3}\sqrt{5} \approx 5.3$

d.
$$\frac{2}{3}\sqrt{2}\approx 0.9$$

18 Set up a definite integral whose value is the area bounded by the graphs of these equations:

$$y = x^2,$$

$$y = 4x$$

a.
$$\int_0^2 (x^2 - 4x) dx$$

b.
$$\int_0^4 (x^2 - 4x) \, dx$$

c.
$$\int_0^2 (4x - x^2) \, \mathrm{d}x$$

d.
$$\int_0^4 (4x - x^2) \, dx$$

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

$$y = \sqrt{3x^2 - x^3}$$

from (x, y) = (3, 0) to (x, y) = (2, 2).

a.
$$\int_3^2 \frac{1}{2} \sqrt{\frac{9x^2 - 40x + 48}{3 - x}} \, \mathrm{d}x$$

b.
$$\int_0^2 \frac{1}{2} \sqrt{\frac{9x^2 - 40x + 48}{3 - x}} \, \mathrm{d}x$$

c.
$$\int_{2}^{3} \frac{1}{2} \sqrt{\frac{9x^2 - 40x + 48}{3 - x}} \, dx$$

d.
$$\int_0^2 \frac{1}{2} \sqrt{\frac{9y^2 - 40y + 48}{3 - y}} \, dy$$

- 20 Suppose that a leaking oil platform is forming a circular oil slick. At the moment, the radius of this slick is 100 metres, and it's increasing at a rate of 3 metres per hour. How fast is the area of the oil slick increasing?
- a. $900\pi \,\mathrm{m^2/h} \approx 2800 \,\mathrm{m^2/h}$
- b. $30,000\pi \,\mathrm{m^2/h} \approx 94,000 \,\mathrm{m^2/h}$
- c. $300\pi\,\mathrm{m^2/h}\approx 940\,\mathrm{m^2/h}$
- d. $600\pi \,\mathrm{m^2/h} \approx 1900 \,\mathrm{m^2/h}$
- 21 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, from the time it is thrown until the time it lands.

- a. How long after it was thrown is it at its maximum height?
- b. What is the ball's maximum height?
- c. What is the ball's minimum height?
- d. At what height was the ball thrown?
- e. At what vertical speed was the ball thrown?
- f. What is the ball's vertical acceleration?

22	Fill in the blank: If	$\lim_{x \to c} f(x) = f(c),$
	then f is	at c .
23	If	$\lim_{h \to 0} \frac{f(c+h) - f(c)}{h}$
	exists, then f is	at <i>c</i> .

- **24** The _____ of y is dy.
- **25** The _____ of f is f'.
- **26** The expression $\int_a^b f(x) dx$ is a(n) ______ integral.

Answers

 $1~\mathrm{C},~2~\mathrm{B},~3~\mathrm{A},~4~\mathrm{A},~5~\mathrm{C},~6~\mathrm{C},~7~\mathrm{A},~8~\mathrm{D},~9~\mathrm{B},~10~\mathrm{C},~11~\mathrm{B},~12~\mathrm{B},~13~\mathrm{C},~14~\mathrm{C},~15~\mathrm{C},~16~\mathrm{D},~17~\mathrm{B},~18~\mathrm{D},~19~\mathrm{C},~20~\mathrm{D}.$

- 21 A 5/32 s, B 409/64 ft, C 0, D 6 ft, E 5 ft/s, F -16 ft/s².
- 22 continuous
- 23 differentiable
- 24 differential
- 25 derivative
- 26 definite