1. Find the domain of the function $\dfrac{1}{\sin(x-3)}$.

(a) $x \neq 3 + \pi n,\ n = 0, \pm 1, \ldots$

(b) $x \neq \pi$

(c) all x

(d) $3 < x < 3 + \pi$

(e) $3 < x < 6 + 2\pi$

2. If $f(x) = x^3$, $g(x) = \sin(x-2)$, find the composite function $f(g(x))$.

(a) $\sin^3(x-2)$

(b) $\sin(x^3 - 2)$

(c) $x^3 \sin(x-2)$

(d) $x^3 + \sin(x-2)$

(e) $\sqrt[3]{\sin(x-2)}$

3. Find $\lim_{x \to 0^-} f(x)$ if

$$f(x) = \begin{cases} 1 - x & \text{if } x \leq 0 \\ 2 & \text{if } x > 0 \end{cases}$$

(a) 1

(b) 2

(c) does not exist

(d) $\frac{3}{2}$

(e) 0

4. Evaluate the limit if it exists:

$$\lim_{x \to 2} \frac{x - 2}{x^2 - 3x + 2}$$

(a) 1

(b) $-\frac{1}{3}$

(c) $\frac{1}{3}$

(d) -1

(e) The limit does not exist

5. Evaluate the limit if it exists:

$$\lim_{t\to 1}\left[\frac{1}{t-1}-\frac{1}{t^2-1}\right]$$

(a) the limit does not exist

(b) 0

(c) $\frac{1}{2}$

(d) $-\frac{1}{2}$

(e) 1

6. Find a constant c that makes $g(x)$ continuous on $(-\infty,\infty)$.

$$g(x)=\begin{cases} cx+1 & \text{if } x\le 2 \\ x+c & \text{if } x>2 \end{cases}$$

(a) $c=1$

(b) No value of c makes $g(x)$ continuous

(c) $c=2$

(d) $c=3$

(e) $c=-\frac{1}{2}$

7. Which one of the following is true about $\lim_{h\to 0} \dfrac{\sqrt{4+h}-2}{h}$?

(a) It is the derivative of $f(x) = \sqrt{4+x}$ at $x = 0$.

(b) It is undefined.

(c) It is the derivative of $f(x) = \sqrt{4+x}$ at $x = 4$.

(d) It is the derivative of $f(x) = \sqrt{4+x}$ at $x = 16$.

(a) It is the derivative of $f(x) = \sqrt{4+x}$ at $x = 2$.

8. Differentiate $f(x) = \dfrac{x+2}{3x+4}$.

(a) $\dfrac{-2}{(3x+4)^2}$

(b) $\dfrac{2x+2}{(3x+4)^2}$

(c) $\dfrac{6x-2}{(3x+4)^2}$

(d) $\dfrac{10}{(3x+4)^2}$

(e) $\dfrac{6x+10}{(3x+4)^2}$

9. Find the limit $\lim_{x\to 0} \dfrac{\sin^2(5x)}{x^2}$.

(a) 25 (b) 5 (c) $\dfrac{1}{5}$ (d) 1 (e) doesn't exist

10. If $f(x) = 3\tan x$, what is $f'(x)$ at $x = 0$?

(a) 3 (b) 0 (c) $\frac{1}{3}$ (d) 9 (e) $\frac{4}{3}$

11. Let f and g be two functions such that $f'(3) = 7$, $f'(5) = 1$, $g(3) = 5$, $g'(3) = 2$. If $F(x) = f(g(x))$ find $F'(3)$.

(a) 2 (b) 14 (c) 35 (d) 5 (e) 10

12. Find $\frac{dy}{dx}$, given that y is defined implicitly as a function of x by the equation

$$x^2 + xy + y^3 = 1$$

(a) $-\frac{2x+y}{x+3y^2}$ (b) $-\frac{x+2y}{3x^2+y}$ (c) $\frac{2x-y}{x+3y^2}$ (d) $-\frac{x+y}{3x+y^2}$ (e) $\frac{x+y^2}{x+3y^2}$

13. The position function of a particle moving along a straight line is $s = 2t^3 - 9t^2$. Find its acceleration when $t = 1$.

(a) -6 (b) -12 (c) -7 (d) -3 (e) 12

14. If $xy = 1$ and $\frac{dx}{dt} = 4$, find $\frac{dy}{dt}$ when $x = 2$.

(a) -1 (b) 1 (c) 0 (d) -2 (e) 2

15. An ice cube is melting and the length x of its side changes at a rate $\frac{dx}{dt} = -0.1$ cm/min. At what rate (in cm^3/min) is the volume of the ice cube changing at the time when $x = 1$ cm ?

(a) -0.3 (b) -0.1 (c) 0 (d) -0.6 (e) -0.9

16. The absolute maximum value of $f(x) = x^3 - 12x + 1$ over the interval $[-3, 5]$ is

(a) 66 (b) 17 (c) 10 (d) 93 (e) 42

17. Compute

$$\lim_{x \to \infty} \frac{3x^3 - 3x}{\sqrt{4x^6 + x}}$$

(a) $\frac{3}{2}$

(b) $\frac{3}{\sqrt{2}}$

(c) 0

(d) $\frac{3}{4}$

(e) does not exist

18. Let

$$y = f(x) = -4x^3 + 12x^2 + 36x - 43.$$

Find the interval(s) where $y = f(x)$ is increasing.

(a) $[-1, 3]$

(b) $(-\infty, -1]$ and $[3, \infty)$

(c) $(-\infty, \infty)$

(d) $(-\infty, 1]$ and $[3, \infty)$

(e) $[-3, 1]$

19. Let

$$y = f(x) = x^2 + \frac{2}{x}.$$

Which of the following is true?

(a) $f(x)$ has a local minimum at $x = 1$ and its graph is concave up at $x = 1$.

(b) $f(x)$ has a local minimum at $x = 1$ and its graph is concave down at $x = 1$.

(c) $f(x)$ has a local maximum at $x = 1$ and its graph is concave up at $x = 1$.

(d) $f(x)$ has a local maximum at $x = 1$ and its graph is concave down at $x = 1$.

(e) $f(x)$ has neither a local maximum nor a local minimum at $x = 1$.

20. Which of the following graphs has exactly one inflection point?

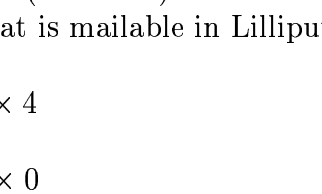
(a)

(b)

(c)

(d)

(e)



21. Lilliputian postal requirements specify that rectangular packages must have height plus the perimeter of the base at most 12 inches. Find the dimensions (in inches) of the rectangular box with square base of greatest volume that is mailable in Lilliput.

(a) $2 \times 2 \times 4$

(b) $6 \times 6 \times 0$

(c) $6 \times 6 \times 2$

(d) $2 \times 2 \times 8$

(e) $4 \times 4 \times 4$

22. Find the most general antiderivative of $f(x) = 2\cos x + 5$.

(a) $2\sin x + 5x + C$

(b) $-2\sin x + 5x + C$

(c) $\cos^2 x + 5x + C$

(d) $-\cos^2 x + 5x + C$

(e) $-2\sin x + C$

23. If $f'(x) = 2x - 3$ and $f(0) = 6$ find $f(2)$.

(a) 4

(b) 1

(c) 6

(d) 5

(e) -2

24. Find $\sum_{i=1}^{10}(2i - 3)$.

(a) 80

(b) 25

(c) 77

(d) 107

(e) 52

25. Find $\int_1^6 (2x-4)dx$.

(a) 15

(b) 16

(c) 32

(d) 30

(e) 24