1. $\lim\limits_{x \to 1} \dfrac{x^2 - 1}{x^3 - 1} =$

    (a) $\dfrac{2}{3}$ ————————————————————————————(correct)

    (b) ∞

    (c) 0

    (d) 2

    (e) $\dfrac{3}{2}$

2. If $\lim\limits_{x \to 3} \dfrac{x^2 - 2x - 3}{x^2 + 2x - 15} = L_1$ and $\lim\limits_{x \to 0} \dfrac{(x + 2)^2 - 4}{x} = L_2$, then $L_2 - L_1 =$

    (a) $\dfrac{7}{2}$ ————————————————————————————(correct)

    (b) ∞

    (c) 0

    (d) 4

    (e) $\dfrac{2}{7}$

3. $\lim\limits_{x \to -\infty} \dfrac{5x}{(2x-1)^2} =$

    (a) 0 ————————————————————————————————(correct)

    (b) ∞

    (c) $-\infty$

    (d) $\dfrac{5}{2}$

    (e) $\dfrac{5}{4}$

4. $\lim\limits_{x \to +\infty} \left(\sqrt{x^2 + x} - x \right) =$

    (a) $\dfrac{1}{2}$ ————————————————————————————(correct)

    (b) ∞

    (c) $-\infty$

    (d) 0

    (e) 1

5. The function $f(x) = \dfrac{x - 3}{x^3 - 9x}$ is discontinuous at

    (a) both $x = 0$ and $x = 3$ ————————————————————(correct)

    (b) $x = 0$ only

    (c) $x = -3$ only

    (d) $x = 3$ only

    (e) $x = 1$ only

6. The function $f(x) = \dfrac{x^4}{x^4 - 1}$ is discontinuous at

    (a) both $x = 1$ and $x = -1$ ————————————————————(correct)

    (b) $x = -1$ only

    (c) $x = 0$ only

    (d) $x = 2$ only

    (e) $x = 1$ only

7. The equation of tangent line to the curve $y = f(x) = x^2 + 2x + 3$ at the point $(1, 6)$ is

    (a) $y = 4x + 2$ ————————————————————————(correct)

    (b) $y = 4x - 2$

    (c) $y = 6x$

    (d) $y = -4x + 10$

    (e) $y = x + 6$

8. The equation of the tangent line to the curve $y = \dfrac{\sqrt{x}(2 - x^2)}{x}$ when $x = 4$ is

    (a) $y = \dfrac{-25}{8}x + \dfrac{11}{2}$ ————————————————————(correct)

    (b) $y = \dfrac{-27}{8}x + \dfrac{13}{2}$

    (c) $y = -3x + 2$

    (d) $y = \dfrac{27}{8}x - \dfrac{13}{2}$

    (e) $y = 3x - 2$

9. If $y = f(x)$ and $\dfrac{dy}{dx} = 12$ at $x = 3$. Assume x changes from 3 to 3.2. Then the estimate change in y is equal to

    (a) 2.4 —————————————————————————————(correct)

    (b) 12

    (c) 0.6

    (d) 1.2

    (e) 6

10. Let $\bar{c} = 0.1q^2 - 0.2q + 5 + \dfrac{5000}{q}$ be the average cost function. Then the cost of producing the 11-th item is approximately equal to

    (a) 31 —————————————————————————————(correct)

    (b) 100

    (c) 27

    (d) 33

    (e) 51

11. A consumption function is given by

$$C = 6 + \frac{3I}{4} - \frac{\sqrt{I}}{3}.$$

Then at $I = 25$, the marginal propensity to save is equal to

(a) 17/60 ——————————————————————————(correct)

(b) 43/60

(c) -43/60

(d) 37/60

(e) -21/30

12. If $y = 2u^2 - 3u - 2$ and $u = x^2 + 4$. Then $\dfrac{dy}{dx}$ at $x = 1$ is

(a) 34 ——————————————————————————(correct)

(b) 30

(c) 26

(d) 31

(e) 18

13. If $y = (x^3 - x^2 + 1)^{100}$, then $y'(1) =$

    (a) 100 ———————————————————————————(correct)

    (b) 9900

    (c) 99

    (d) 1000

    (e) 0

14. The derivative of the function $y = \ln\left(\dfrac{2x+3}{3x-4}\right)$ is given by

    (a) $\dfrac{-17}{(2x+3)(3x-4)}$ ———————————————————(correct)

    (b) $\dfrac{-15}{(2x+3)(3x-4)}$

    (c) $\dfrac{-19}{(2x+3)(3x-4)}$

    (d) $\dfrac{15}{(2x+3)(3x-4)}$

    (e) $\dfrac{17}{(2x+3)(3x-4)}$

15. The slope of the curve $y = \dfrac{x}{\ln x}$ at $x = 3$ is

    (a) $\dfrac{1}{\ln 3} - \dfrac{1}{(\ln 3)^2}$ (correct)

    (b) $\dfrac{1}{\ln 5} - \dfrac{1}{(\ln 5)^2}$

    (c) $\dfrac{1}{\ln 3} + \dfrac{1}{(\ln 3)^2}$

    (d) $\dfrac{3}{\ln 3}$

    (e) $\ln 3 + (\ln 3)^2$

16. If $f(x) = e^{1/x}$, then the slope of the tangent line at $x = 2$ is equal to

    (a) $\dfrac{-\sqrt{e}}{4}$ (correct)

    (b) $\dfrac{\sqrt{e}}{4}$

    (c) $4\sqrt{e}$

    (d) $-4\sqrt{e}$

    (e) $\dfrac{\sqrt{e}}{2}$

17. The slope of the tangent line to the curve $y = 5^{x \ln x}$ at $x = 1$ is equal to

   (a) ln 5 ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯(correct)

   (b) ln 2

   (c) 5 ln 5

   (d) 0

   (e) ln 3

18. The slope of the tangent line to the curve of $f(x) = 3x - \dfrac{\frac{2}{x} - \frac{3}{x-1}}{x - 2}$ at $x = -1$ is

   (a) 91/36 ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯(correct)

   (b) 125/36

   (c) 87/36

   (d) 37/18

   (e) 81/18

19. If $x + xy + y^2 = 7$, where y is a function of x. Then $\dfrac{dy}{dx}$ at the point $(1, 2)$ is equal to

   (a) $-3/5$ ————————————————————————(correct)
   (b) $-1/5$
   (c) $-3/4$
   (d) $3/5$
   (e) $1/5$

20. Given the demand equation $p = 100 - q^2$, the rate of change of q with respect to p at $q = 2$ is

   (a) $-1/4$ ————————————————————————(correct)
   (b) 4
   (c) -4
   (d) 0
   (e) 1