

1. $\lim_{h \rightarrow 0} \frac{(3+h)^2 - 3^2}{h} =$

(a) 6 _____(correct)

(b) 0

(c) 3^2

(d) -3^2

(e) 3

2. $\lim_{x \rightarrow -\infty} \frac{x^2}{(1-3x)^2} =$

(a) $\frac{1}{9}$ _____(correct)

(b) $-\frac{1}{9}$

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

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

(e) ∞

3. The domain of $f(x) = \ln(\sqrt[3]{x})$ is

- (a) $(0, \infty)$ _____(correct)
- (b) $(-\infty, \infty)$
- (c) $[0, \infty)$
- (d) $(-e, \infty)$
- (e) $(-\sqrt[3]{e}, \infty)$

4. The equation of the tangent line to the curve $f(x) = \frac{x}{7} + \frac{7}{x}$ at $x = 7$ is

- (a) $y = 2$ _____(correct)
- (b) $y = 2x + 7$
- (c) $y = 7$
- (d) $y = 7x + 2$
- (e) $y = \frac{1}{7}x + 2$

5. If $y = 4u^3 + 10u^2 - 3u - 7$ and $u = \frac{4}{3x - 5}$ then, the value of $\frac{dy}{dx}$ when $x = 1$ is equal to

- (a) -15 _____(correct)
- (b) -5
- (c) -3
- (d) -12
- (e) -18

6. If $x^2 + 4y^2 = 4$, then $\frac{dy^2}{dx^2} =$

- (a) $\frac{-1}{4y^3}$ _____(correct)
- (b) $\frac{-y^2}{2 + y}$
- (c) $y\sqrt{y} - y^2$
- (d) $\frac{-y^2 - 1}{y^2 + 1}$
- (e) $\frac{1 - y^3}{2\sqrt{y}}$

7. $f(x) = 2x^2 - x^4$ has

- (a) 3 critical values _____(correct)
- (b) 2 critical values
- (c) 1 critical value
- (d) no critical values
- (e) 4 critical values

8. $f(x) = x + \frac{1}{x}$ is concave downward over

- (a) $(-\infty, 0)$ _____(correct)
- (b) $(-\infty, 1)$
- (c) $(-\infty, \infty)$
- (d) $(0, \infty)$
- (e) $(1, \infty)$

9. $f(x) = xe^x$ is increasing over:

- (a) $(-1, \infty)$ _____(correct)
- (b) $(-e, \infty)$
- (c) $(-e^2, \infty)$
- (d) $(-\infty, \infty)$
- (e) $\left(-\frac{1}{2}e, \infty\right)$

10. The total number of all vertical and horizontal asymptotes of $f(x) = \frac{x^4 + 1}{1 - x^4}$ is

- (a) 3 _____(correct)
- (b) 4
- (c) 5
- (d) 6
- (e) 2

11. $\int x(2x^2 + 1)^{-1} dx =$

(a) $\frac{1}{4} \ln(2x^2 + 1) + c$ _____(correct)

(b) $\frac{1}{2} \ln |x^2 - x| + c$

(c) $\frac{1}{4} \ln |2x^2 - 1| + c$

(d) $x \ln |2x^2 + 1| + c$

(e) $\ln \left| \frac{1}{2}x \right| + x^2 + c$

12. $\int \frac{\sqrt{1 + \sqrt{x}}}{\sqrt{x}} dx =$

(a) $\frac{4}{3} \sqrt{(1 + \sqrt{x})^3} + c$ _____(correct)

(b) $\frac{\sqrt{1 + x}}{\sqrt{x}} + c$

(c) $\frac{1}{2} \sqrt[3]{(1 + \sqrt{x})^2} + c$

(d) $\sqrt{x} + \frac{1}{\sqrt{x}} + c$

(e) $\sqrt{x + \frac{1}{\sqrt{x}}} + c$

13. $\int_5^5 e^{x^2} dx + \int_0^{\sqrt{3}} \frac{1}{2\sqrt{3}} dx =$

(a) $\frac{1}{2}$ _____(correct)

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

(c) $\frac{1}{2\sqrt{3}}$

(d) $e^{25} + \frac{1}{\sqrt{3}}$

(e) $e^{25} \frac{1}{2\sqrt{3}}$

14. The area under the curve $f(x) = 2x \ln x$ over $[1, e]$ is equal to

(a) $\frac{1}{2}(e^2 + 1)$ _____(correct)

(b) $e^2 - \frac{1}{2}$

(c) $2e$

(d) $e^2 + 2$

(e) $e^2 + \sqrt{2}$

15. $\int \frac{x+10}{x^2-x-2} dx =$

(a) $4 \ln |x-2| - 3 \ln |x+1| + c$ _____(correct)

(b) $\ln |x+10| - \ln |x-2| + c$

(c) $4 \ln |x+2| - \ln |x+1| + c$

(d) $\ln |x-10| + 3 \ln |x+1| + c$

(e) $5 \ln |x-2| - 3 \ln |x+1| + c$

16. If $\frac{dr}{dq} = \frac{200}{(q+2)^2}$ is a marginal-revenue function, then the demand function is

(a) $p = \frac{-200}{q(q+2)}$ _____(correct)

(b) $p = \frac{-1}{q^2+2}$

(c) $p = \frac{100}{q^2+q}$

(d) $p = \frac{-100}{q^2+1}$

(e) $p = \frac{-200}{q^2+q}$

17. $\int \cos(5x) \, dx =$

(a) $\frac{1}{5} \sin(5x) + c$ _____(correct)

(b) $5 \sin(5x) + c$

(c) $\frac{1}{5} \cos(5x) + c$

(d) $-5 \cos(5x) + c$

(e) $5 \sin\left(\frac{1}{5}x\right) + c$

18. If $f(x, y) = xy^2 + x^2y$, then $f_x(3, 4) + f_y(3, 4) =$

(a) 73 _____(correct)

(b) 60

(c) 56

(d) 42

(e) 84

19. If $z^2 = xy$, then $\frac{\partial^2 z}{\partial x^2} =$

(a) $-\frac{1}{4}y^2 \cdot \frac{1}{z^3}$ _____(correct)

(b) $-4y^2z^3$

(c) $-\frac{1}{2}\frac{y^3}{z^2}$

(d) $-2\frac{y^2}{z^4}$

(e) $-\frac{y^3}{4z^2}$

20. If the absolute minimum of $f(x, y) = x^2 - 4x + 2y^2 + 4y + 7$ occurs at (a, b) , then $a + b =$

(a) 1 _____(correct)

(b) -1

(c) 2

(d) 0

(e) -2

21. If $y = \tan(e^x)$, then $y' =$

(a) $e^x \sec^2(e^x)$ _____(correct)

(b) $2e \tan(e^x)$

(c) $\tan(e^x) \sec(e^x)$

(d) $\sec^2(e^x) - 1$

(e) $e^x \tan(x)$