1. The limit $\lim_{x \to -\frac{1}{2}^+} \dfrac{2x^3 - x^2 - x}{(8x^3 + 1)^2}$ is equal to

(a) $+\infty$

(b) $-\infty$

(c) 0

(d) $\dfrac{3}{64}$

(e) $-\dfrac{3}{4}$

2. For $f(x) = 7 - 3x^3$, the percentage rate of change of $f(x)$ at $x = 1$ is

(a) $-2.25\,\%$

(b) $-1\,\%$

(c) $-2\,\%$

(d) $3\,\%$

(e) $2.15\,\%$

3. The y-intercept of the tangent line to the curve $y = \dfrac{\sqrt{x}+x}{2+3\sqrt{x}}$ at $x = 1$ is

(a) $\dfrac{11}{50}$

(b) $\dfrac{9}{50}$

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

(d) $\dfrac{29}{50}$

(e) $\dfrac{1}{5}$

4. If $y = u^3 + \ln u + 5$ and $u = \sqrt{x}$, then $y'|_{x=4} =$

(a) $\dfrac{25}{8}$

(b) 2

(c) $\dfrac{13}{4}$

(d) $\dfrac{1}{16}$

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

5. From $\tan(xy) = \sin^2(y^2)$, the value of y' at $x = 0$ and $y = \sqrt{\frac{\pi}{4}}$ is

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

(b) $\frac{1}{4}\sqrt{\frac{\pi}{4}}$

(c) $\frac{1}{2}\sqrt{\frac{\pi}{4}}$

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

(e) $\frac{1}{4}$

6. If $y = \log_2(8t^{\ln 2})$, then y' is equal to

(a) $\frac{1}{t}$

(b) $\frac{\ln 8}{t}$

(c) $\frac{\ln 2}{t}$

(d) $\frac{1}{t \ln 2}$

(e) $\frac{3 \ln 2}{2t}$

7. A country's saving S in terms of the national income I is defined implicitly by the equation

$$S^2 + \frac{1}{4}I^2 = SI + I.$$

The marginal propensity of the country to save when $I = 5$ and $S = 1$ is

(a) $\frac{1}{6}$

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

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

(d) $\frac{1}{5}$

(e) $\frac{1}{4}$

8. The absolute minimum value of $f(x) = (x-1)^{2/3} + 2$ on $[0, 9]$ is

(a) 2

(b) 3

(c) 1

(d) 0

(e) 4

9. The function $f(x) = \dfrac{x}{x^2+1}$

(a) is concave up on $(-\sqrt{3}, 0)$

(b) is concave down on $(\sqrt{3}, \infty)$

(c) is concave up on $(0, \sqrt{3})$

(d) is concave up on $(-\infty, 0)$

(e) has two inflection points

10. The function $f(x) = \dfrac{2x^{3/2} + 2x - 3}{\sqrt{x}+1}$ has

(a) one oblique asymptote

(b) two horizontal asymptotes

(c) two vertical asymptotes

(d) one horizontal asymptote and one vertical asympote

(e) one oblique asymptote and one vertical asymptote

11. Suppose that the cost-function is given by $c(q) = q^3 + 200q + 1000$, and the price of one item q is \$500. Then the maximum profit is

(a) \$1000

(b) \$4000

(c) \$5000

(d) \$2000

(e) \$3000

12. The function $f(x) = x^3 - 12x - 5$

(a) decreases on $(-2, 2)$

(b) increases on $(-\infty, -1)$

(c) increases on $(-3, \infty)$

(d) decreases on $(2, \infty)$

(e) decreases on $(-\infty, -2)$

13. $\int_0^1 \frac{x \ln^2(2-x^2)}{x^2-2}\, dx =$

(a) $-\frac{\ln^3 2}{6}$

(b) $\frac{1}{6}(1-\ln^3 2)$

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

(d) $\frac{1}{3}\ln^3 2$

(e) $\frac{\ln^3 2}{6}$

14. If $\frac{d^2r}{dt^2} = 15\sqrt{t} + \frac{3}{\sqrt{t}}$, $r'(1) = 8$ and $r(1) = 0$, then $r|_{t=0} =$

(a) 0

(b) 1

(c) 2

(d) -1

(e) 3

15. The plane that is parallel to the yz-plane and passes through the point $(-1, 2, -4)$ has equation

(a) $x = -1$

(b) $x = 4$

(c) $y = -1$

(d) $z = 4$

(e) $y = 2$

16. If $f(x, y, z) = z^3 y^2 \ln x$, then $f_{xxyz}|_{(2,-1,1/3)} =$

(a) $\frac{1}{6}$

(b) $\frac{1}{4}$

(c) 1

(d) 2

(e) -4

17. The slope of the tangent line to the curve $y = e^{\cos^2(\pi - x)}$ at $x = \dfrac{3\pi}{4}$ is

(a) $\sqrt{e}$

(b) $2\sqrt{e}$

(c) $-\dfrac{1}{\sqrt{e}}$

(d) $-2\sqrt{e}$

(e) $\dfrac{1}{\sqrt{e}}$

18. The function $f(x, y) = x^2 - 4xy + y^3 + 4y$ has a

(a) relative minimum value 0 and a saddle point

(b) relative minimum value 1 and a saddle point

(c) relative maximum value 4

(d) relative maximum value -1

(e) relative maximum value 2 and a saddle point

19. $\int_1^e x(\ln x)^2\,dx =$

(a) $\dfrac{e^2-1}{4}$

(b) $\dfrac{3e^2}{2}-1$

(c) $\dfrac{e^2}{4}$

(d) $\dfrac{e^2+1}{4}$

(e) $\dfrac{2e^2+1}{2}$

20. The exact area of the region bounded by the graphs of $y=x^2$ and $y=-x^2+4x$ is

(a) $\dfrac{8}{3}$

(b) $\dfrac{1}{3}$

(c) $\dfrac{15}{4}$

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

(e) 1

21. The area of the region bounded by the x-axis, the curve $y = 4 - x^2$ and the curve $y = 3\sqrt{x}$ is

(a) $\frac{11}{3}$

(b) $\frac{16}{3}$

(c) 3

(d) 4

(e) $\frac{13}{3}$

22. $\int_{\pi/4}^{\pi/2} \cot x \csc^2 x \, dx =$

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

(b) 2

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

(d) 1

(e) $\sqrt{2}$

23. $\int_3^4 \frac{12x - 2x^2 - x^3 - 7}{x - 2}\, dx =$

(a) $\ln 2 - \frac{67}{3}$

(b) $\frac{16}{3} + \ln 2$

(c) $-\frac{11}{3} - \ln 2$

(d) $\frac{40}{3} - \ln 2$

(e) $-\frac{37}{3} + \ln 2$

24. The marginal-cost of printing a poster when q posters have been printed is

$$\frac{dc}{dq} = \frac{1}{2\sqrt{q}}.$$

If c is in dollars, then the cost involved to increase production from 25 to 100 units is

(a) \$5

(b) \$10

(c) \$3

(d) \$7

(e) \$1

25. A manufacturer determines that the profit P and the advertising expenditures are related as

$$P(x, y) = -3x^2 - 2y^2 + x + 2y + 4xy + 150,$$

where x is the amount spent on television advertisement and y is the amount spent on magazine advertising. The manufacturer's maximum profit is

(a) $\frac{611}{4}$

(b) $\frac{137}{2}$

(c) $\frac{349}{2}$

(d) $\frac{579}{4}$

(e) 213

 ANSWER KEY

Q	MM	V1	V2	V3	V4
1	a	b	b	a	a
2	a	d	a	e	a
3	a	d	b	c	d
4	a	a	d	d	a
5	a	b	b	e	e
6	a	d	c	e	c
7	a	b	a	e	b
8	a	c	d	a	a
9	a	d	d	c	b
10	a	d	b	d	e
11	a	e	e	a	b
12	a	a	c	e	e
13	a	a	e	c	a
14	a	a	b	c	e
15	a	c	b	d	a
16	a	d	c	d	a
17	a	c	d	b	a
18	a	e	d	b	b
19	a	d	a	b	d
20	a	c	e	e	d
21	a	d	a	d	b
22	a	b	b	e	c
23	a	c	a	c	d
24	a	e	c	e	e
25	a	c	a	d	a