1. The limit $\lim_{x \to -3} \dfrac{5x^2 + 14x - 3}{x^3 + 3x^2}$

(a) equals $-\dfrac{16}{9}$

(b) equals 0

(c) tends to $-\infty$

(d) equals $-\dfrac{5}{3}$

(e) does not exist

2. If $f(x) = \ln(x^2 + 1)g(x)$ and $g(0) = \dfrac{1}{4}$, then $f''(0)$ is equal to

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

(b) 0

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

(d) 1

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

3. For $y = \dfrac{3x-2}{(x^2+5)^2}$, $y'|_{x=0} =$

(a) $\dfrac{3}{25}$

(b) 0

(c) -4

(d) 2

(e) -1

4. The deriative of $f(x) = e^{\sqrt{1+\ln^2 x}}$ at $x = e$ is

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

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

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

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

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

5. If $\cos(x-y) = y^2 \sin x$, then the value of y' at $x = \dfrac{\pi}{2} = y$ is

(a) 0

(b) -2

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

(d) 3

(e) -3

6. The derivative of $y = (x^3+2)^{1/x}$ at $x = 1$ is

(a) $3(1-\ln 3)$

(b) $3-\ln 3$

(c) $1-3\ln 3$

(d) $3(1-3\ln 3)$

(e) $3(3-\ln 3)$

7. If $f(x) = xe^x$, then $f^{(3)}(-1) =$

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

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

(c) 0

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

(e) 1

8. The absolute minimum value of $f(x) = \frac{2}{3}\ln x + x^{-2/3}$ on the interval $[e^{-3}, e^3]$ is

(a) 1

(b) $e^2 - 2$

(c) $e^{-3} + 2$

(d) $1 - e^3$

(e) $2 - 3e^2$

9. If $x \in (-2, 2)$, then the function $f(x) = x\sqrt{4 - x^2}$

(a) is concave down on (0,2) and has inflection point at x=0

(b) is concave up on (0,2) and has inflection point at x=0

(c) is concave down on (-2,0) and has inflection point at x=1

(d) has two inflection points at x=0,1

(e) is concave down on (2,0) and has inflection point at x=1

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

(a) one horizontal asymptote $y = 0$ and one vertical asymptote $x = -2$

(b) two horizontal asymptotes $y = -1, 0$

(c) two vertical asymptotes $x = 1, -2$

(d) one oblique asymptote $y = x + 2$

(e) one horizontal asymptote $y = 1$ and one vertical asymptote $x = 1$

11. Suppose that the cost-function is given by $c = .01q^2 + 5q + 100$.
The average price $\bar{c}$ is minimum for $q =$

(a) 100

(b) 105

(c) 95

(d) 101

(e) 110

12. For the function $f(x) = x^{3x} - x$, x changes from 1 to 1.01.
Using differentials, approximate value of $f(1.01)$ is

(a) 0.02

(b) 3.01

(c) 0.03

(d) 3.02

(e) 0.01

13. $\int \frac{6e^{1/x}}{x^2}\,dx =$

(a) $-6e^{1/x} + C$

(b) $-6e^{x} + C$

(c) $\frac{e^x}{6} + C$

(d) $\frac{e^{1/x}}{5} + C$

(e) $-\frac{e^x}{4} + C$

14. If $\frac{dy}{dx} = 1 + \tan^2 x + \sin 3x$ and $y(0) = 0$, then $y(\pi)$ is

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

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

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

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

(e) $\pi - \frac{2}{3}$

15. The trace of surface $x^2 + 4y^2 - z^2 = 1$ in xz-plane is

(a) hyperbola

(b) circle

(c) ellipse

(d) parabola

(e) plane

16. If $f(x, y, z) = \dfrac{x^2}{y + z^2}$, then $\left.\dfrac{\partial^4 f}{\partial z \partial y \partial x^2}\right|_{\substack{x=0 \\ y=0 \\ z=2}} =$

(a) $\dfrac{1}{4}$

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

(c) 0

(d) 4

(e) 2

17. The equation of tangent line to the graph of $y = \sec^2\left(\frac{\pi}{2} - x\right)$ at $x = -\frac{\pi}{2}$ is

(a) $y = 1$

(b) $y = 2$

(c) $y = x + 1$

(d) $y = 1 - x$

(e) $y = \frac{2}{3}x$

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

(a) a relative minimum value -1 and a saddle point

(b) a relative minimum value 1 and a saddle point

(c) a relative maximum value 2

(d) a relative minimum value -4

(e) a relative maximum value 3 and a saddle point

19. $\int_1^e z^2 \ln z \, dz =$

(a) $\frac{2e^3+1}{9}$

(b) $3e^3$

(c) $1+e^3$

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

(e) 2

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

(a) $\frac{125}{6}$

(b) 124

(c) 52

(d) 73

(e) $\frac{115}{6}$

21. The area bounded by curve $y = 4 + 3x - x^2$ and x-axis is

(a) $\frac{125}{6}$

(b) $\frac{124}{3}$

(c) $\frac{120}{7}$

(d) $\frac{110}{3}$

(e) $\frac{95}{6}$

22. $\int_0^2 |x - x^2| dx =$

(a) 1

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

(c) -2

(d) 3

(e) -1

23. $\int_0^1 [(\sqrt{x}+1)^2 - (x+1)^2]dx =$

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

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

(c) $\frac{5}{7}$

(d) 4

(e) 2

24. If $\int_0^{\pi/2} \cos^2(kx)dx = \frac{1}{2}\left(\frac{\pi}{2}+1\right)$, then $k =$

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

(b) 2

(c) $-\frac{1}{4}$

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

(e) -2

25. A company makes two types of computers. The cost of producing x units of type A and y units of type B is given by the function $C(x,y) = xy + \frac{2}{x} + \frac{4}{y}$. The minimum cost is

(a) 6

(b) 4

(c) 3.5

(d) 5

(e) 1.5

ANSWER KEY

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