1. If $y = e^x + x^2\, x^e + 2\,\pi^e - e^\pi + 1$, then $y' =$

(a) $e^x + (e+2)\, x^{e+1}$

(b) $e^x + (e+2)\, x^{e+1} - \pi\, e^\pi$

(c) $e^x + (e+2)\, x^{e+1} + 2e\, \pi^{e-1}$

(d) $e^x + 2x^{e+1}$

(e) $e^x + e\, x^{e+1}$

2. If $y = x\, \tan^{-1}\, x - \ln\, \sqrt{1+x^2}$, then $y'(1) =$

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

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

(c) 1

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

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

3. Let

$$y = \sqrt[3]{\frac{(x^2+1)^5\sqrt{x}}{(3x-1)^2}}.$$

The instantaneous rate of change of y with respect to x at $x = 1$ is:

(a) $\frac{5}{3}$

(b) $\frac{10}{3}$

(c) $\frac{17}{3}$

(d) 1

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

4. If the line tangent to the parabola $y = ax^2 + bx$ at the point $(1, 1)$ is parallel to $y = 3x - 2$, then $a - b =$

(a) 3

(b) -1

(c) -2

(d) 2

(e) 1

5. If $f(2) = 10$ and $f'(x) = x^2\, f(x)$ for all x, then $f''(2) =$

(a) 200

(b) 160

(c) 0

(d) does not exist

(e) 240

6. Let $g(x) = \dfrac{1 + x\, f(x)}{\sqrt{x}}$. If f is differentiable such that $f(1) = 3$ and $f'(1) = 2$, then $g'(1) =$

(a) 3

(b) 2

(c) 1

(d) 0

(e) 5

7. If $f(x) = \cos(2x)\,\sin(2x)$, then $f''(x) =$

(a) $-8\,\sin(4x)$

(b) $8\,\cos(4x)$

(c) $-16\,\sin(2x)$

(d) $16\,\sin(2x)$

(e) $16\,\cos(2x)\,\sin(2x)$

8. If $y = e^x\,\sec\,x$, then $y' =$

(a) $y(1 + \tan\,x)$

(b) $y(1 + \sec\,x)$

(c) $y(\csc\,x - \tan\,x)$

(d) $y(1 + \sec^2\,x)$

(e) $y(\sec\,x + \tan\,x)$

9. $\lim_{x\to 0} \dfrac{2x + \sin 3x}{\sin 5x} =$

(a) 1

(b) 0

(c) 2

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

(e) 5

10. Let the graph of f as shown and $g(x) = \sqrt{f(x)}$. Then $g'(3) =$

(a) $-\sqrt{2}/6$

(b) -2

(c) 2

(d) $\sqrt{2}/2$

(e) -1

11. If $y = f(2 - 3\,f(4 - 5t)), f(4) = -2/3$ and $f'(4) = 1$ then $y'\,(0) =$

(a) 15

(b) 18

(c) 20

(d) 14

(e) 12

12. Consider the curve given by the equation $\sin\,(x^2 + y^2) = x + y$. The slope of the tangent line at $P(0, 0)$ is:

(a) -1

(b) 1

(c) 0

(d) 2

(e) -2

13. Let $f(x) = \left(\sin \frac{\pi\, x}{2}\right)^{\ln(x)}$, then $f'(1) =$

(a) 0

(b) 1

(c) 1/2

(d) π

(e) does not exist

14. If $f(x) = x \ln x$ then $f^{(61)}(1) =$

(a) $-59\,!$

(b) $60\,!$

(c) $-60\,!$

(d) $61\,!$

(e) $58\,!$

15. If $f(6) = 7$ and $f'(6) = 3$, then $(f^{-1})'(7) =$

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

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

(c) $\frac{1}{7}$

(d) 6

(e) 7

16. The position of a particle is given by

$$s(t) = 2t^3 - 9t^2 + 12t + 5, \qquad t \geq 0,$$

where t is measured in seconds and s in meters. The distance in meters traveled during the first 3 seconds is

(a) 11

(b) 20

(c) 15

(d) 9

(e) 10

17. A spotlight on the ground shines on a wall 10 m away. If a man 2 m tall walks from the spotlight towards the building at a speed of 2 m/s. When the man is 4 m from the building, the length of his shadow on the building is:

(a) decreasing at a rate of $\frac{10}{9}$ m/s

(b) decreasing at a rate of $\frac{5}{3}$ m/s

(c) increasing at a rate of $\frac{10}{9}$ m/s

(d) increasing at a rate of $\frac{5}{2}$ m/s

(e) increasing at a rate of 2 m/s

18. The volume of a cube is increasing at a rate of 10 cm^3/min. when the length of the edge is 30 m. At that time the surface area is increasing at the rate:

(a) $\frac{4}{3}\,\text{cm}^2/\text{min}$

(b) $\frac{3}{4}\,\text{cm}^2/\text{min}$

(c) $\frac{4}{9}\,\text{cm}^2/\text{min}$

(d) $\frac{9}{4}\,\text{cm}^2/\text{min}$

(e) $\frac{4}{27}\,\text{cm}^2/\text{min}$

19. $\lim_{x \to 1} \dfrac{xe^x - e}{x - 1}$

(a) $2\,e$

(b) e

(c) $1/e$

(d) $-e$

(e) e^2

20. The position function of a particle moving in a straight line is given by

$$f(t) = t^2\, e^{-t}, \qquad t > 0,$$

where time is measured in seconds. Then the particle is **<u>at rest</u>** at $t =$

(a) 2

(b) 1

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

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

(e) 3

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