1. If $y = (1 + e^x)^{\ln x}$, then $y'(1) =$

   (a) $\ln(1 + e)$ _____(correct)
   (b) 0
   (c) 1
   (d) e
   (e) $(1 + e)$

2. The slope of the tangent line to $y = (x + 1)(x + 2)^2 (x + 3)^2$ at $x = 0$ is equal to

   (a) 96 _____(correct)
   (b) 84
   (c) 64
   (d) 50
   (e) 20

3. If $x^2 + 3x + y^2 = 4y$, then $\dfrac{d^2y}{dx^2}$ when $x = 0$ and $y = 0$ is equal to

(a) $\dfrac{25}{32}$ _____(correct)

(b) $\dfrac{9}{32}$

(c) $-\dfrac{25}{32}$

(d) $\dfrac{16}{32}$

(e) $\dfrac{-9}{32}$

4. At $x = -2$ the function $f(x) = x^2e^x$ has

(a) a relative maximum _____(correct)

(b) a relative minimum

(c) an absolute maximum

(d) an absolute minimum

(e) neither maximum nor minimum

5. The absolute maximum of $f(x) = \dfrac{x}{x^2+1}$ over the interval $[0, 2]$ is equal to

   (a) $\dfrac{1}{2}$ _____(correct)
   (b) 1
   (c) $\dfrac{2}{5}$
   (d) $\dfrac{1}{5}$
   (e) 2

6. The function $f(x) = x^{2/3}$ over the interval $[-8, 8]$ has the

   (a) absolute maximum at $x = 8$ and $x = -8$ _____(correct)
   (b) absolute minimum at $x = 8$
   (c) absolute maximum at $x = 0$
   (d) absolute minimum at $x = -8$ only
   (e) absolute maximum at $x = -8$ only

7. The function $f(x) = \frac{1}{10}x^5 - 3x^3 + 17x + 43$ is concave up on the interval

   (a) $(-3, 0) \cup (3, \infty)$ _____(correct)
   (b) $(-\infty, 0) \cup (3, \infty)$
   (c) $(-3, 3)$
   (d) $(-3, \infty)$
   (e) $(-\infty, -3) \cup (0, 3)$

8. The number of inflection points of the function $f(x) = \frac{x^2 + 1}{x^2 - 2}$ is equal to

   (a) 0 _____(correct)
   (b) 1
   (c) 2
   (d) 3
   (e) 4

9. At $x = -\frac{7}{2}$ the function $y = (x^2 + 7x + 10)^2$ has

   (a) a relative maximum _____(correct)
   (b) a relative minimum
   (c) an absolute maximum
   (d) an absolute minimum
   (e) an inflection point

10. At $x = 0.25$ the function $y = -4x^2 + 2x - 8$ has

   (a) an bsolute maximum _____(correct)
   (b) a relative minimum
   (c) a relative maximum
   (d) an absolute minimum
   (e) an inflection point

11. The function $f(x) = 13e^{-x}$ has

    (a) one horizontal asymptote _____(correct)
    (b) one vertical asymptote
    (c) one vertical and one horizontal asymptote
    (d) no asymptotes
    (e) one horizontal and one oblique asymptote

12. The slope of the oblique asymptote of

$$f(x) = \frac{8x^2 + 9x + 5}{4x - 7}$$

    is equal to

    (a) 2 _____(correct)
    (b) $\frac{8}{7}$
    (c) -2
    (d) 8
    (e) $\frac{-8}{7}$

13. For a monopolist's product, the demand function $p = 85 - 0.05q$ and the cost function is $c = 600 + 35q$. The maximum profit occurs at the price of

    (a) \$60 _____(correct)
    (b) \$600
    (c) \$500
    (d) \$20
    (e) \$100

14. The maximum volume of an open-top box with a square base constructed from $192\,ft^2$ of material is equal to

    (a) $256\,ft^3$ _____(correct)
    (b) $200\,ft^3$
    (c) $400\,ft^3$
    (d) $8\,ft^3$
    (e) $10\,ft^3$

15. Let $f(x) = x^{3x}$, then by using the differentials $f(0.98) \approx$

(a) 0.94 _____ (correct)
(b) 0.98
(c) 0.90
(d) 0.02
(e) -0.02

16.

$$\int \left(6e^u - u^3(\sqrt{u}+1)\right)\, du =$$

(a) $6e^u - \frac{2}{9}u^{\frac{9}{2}} - \frac{u^4}{4} + C$ _____ (correct)
(b) $6e^u - \frac{12}{9}u^{\frac{9}{2}} - \frac{3u^4}{2} + C$
(c) $6e^u - \frac{2}{9}u^{\frac{9}{2}} + \frac{u^4}{4} + C$
(d) $6ue^u - \frac{2}{9}u^{\frac{9}{2}} + \frac{u^4}{4} + C$
(e) $6e^u - \frac{9}{2}u^{\frac{9}{2}} - 4u^4 + C$

17.

$$\int \frac{x^4 - 5x^2 + 2x}{5x^2}\, dx =$$

(a) $\frac{x^3}{15} - x + \frac{2}{5}\ln|x| + C$ _____ (correct)

(b) $\frac{x^3}{3} + \frac{2}{5}\ln|x| + C$

(c) $\frac{x^3}{15} - 5x + 2\ln|x| + C$

(d) $\frac{x^3}{15} - 5x + \frac{2}{3}\ln|x| + C$

(e) $2x^2 - x + \frac{2}{5}\ln|x+1| + C$

18. The marginal revenue of a product is

$$\frac{dr}{dq} = 2000 - 20q - 3q^2.$$

Then the unit price when producing 30 units $p(30) =$

(a) 800 _____ (correct)

(b) 1600

(c) 2000

(d) 500

(e) 1800

19. If $y' = \dfrac{5}{\sqrt{x}}$ and $y(9) = 50$, then $y(16) =$

(a) 60 _____(correct)
(b) 80
(c) 90
(d) $\dfrac{1}{4}$
(e) 4

20.

$$\int x\sqrt{(8-5x^2)^3}\,dx =$$

(a) $-\dfrac{1}{25}(8-5x^2)^{\frac{5}{2}} + C$ _____(correct)
(b) $-\dfrac{1}{50}(8-5x^2)^{\frac{5}{2}} + C$
(c) $\dfrac{1}{25}(8-5x^2)^{\frac{1}{2}} + C$
(d) $\dfrac{1}{25}(8-5x^2)^{\frac{5}{2}} + C$
(e) $-\dfrac{1}{10}(8-5x^2)^{\frac{3}{2}} + C$