1. The slope of the tangent line to the curve $\ln(x^2y) + x = 1$ at the point $(1, 1)$ is equal

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

2. If $y = e^{3x^2}$, then y'' equal

   (a) $6e^{3x^2}\,[1 + 6x^2]$ _____(correct)
   (b) $36e^{3x^2}$
   (c) $e^{3x^2}[1 + 6x^2]$
   (d) $e^{3x^2}[1 + 6x]$
   (e) $6e^{3x^2}$

3. The function $f(x) = 3x^4 - 4x^3 + 4$ has

   (a) only one relative extrema _____(correct)
   (b) only two relative extrema
   (c) only three critical points
   (d) only one critical point
   (e) only three relative extrema

4. The function $f(x) = \sqrt[3]{x}(x-2)$ is increasing on the interval

   (a) $\left[\frac{1}{2}, \infty\right)$ _____(correct)
   (b) $\left[0, \frac{1}{2}\right)$
   (c) $[0, \infty)$
   (d) $(-\infty, 0)$
   (e) $\left(-\infty, \frac{1}{2}\right]$

5. The absolute maximum of $f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 2x + 1$ over the interval $[0, 2]$ is equal to

   (a) $\frac{5}{3}$ _____ (correct)
   (b) $\frac{13}{3}$
   (c) 1
   (d) 0
   (e) $\frac{17}{3}$

6. The curve of the function $f(x) = 1 - \frac{1}{x^2}$ is concave down on the interval

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

7. The number of inflection points of the function $f(x) = e^x - e^{-x}$

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

8. The number of relative minimum of the function $f(x) = (x^2 + 2x - 3)^2$ is

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

9. The graph of function of $f(x) = \dfrac{9x^2 - 16}{2(3x+4)(3x+2)}$ has

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

10. If the graph of the function $f(x) = \dfrac{10x^2 + 6x + 4}{5x - 2}$ has the oblique asymptote $y = ax + b$, then $a + b =$

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

11. $\int \left(7\sqrt[3]{x^4} + 8e^x + \frac{1}{x^2}\right) dx =$

(a) $3\sqrt[3]{x^7} + 8e^x - \frac{1}{x} + c$ (correct)

(b) $\frac{7}{3}\sqrt[3]{x^7} + 8e^x - \frac{1}{x^2} + c$

(c) $\frac{7}{3}\sqrt[3]{x^5} + 8e^x + \frac{1}{x} + c$

(d) $7\sqrt[3]{x^7} + 8e^x - \frac{1}{x} + c$

(e) $\sqrt[3]{x^5} + 8e^x - \frac{1}{x} + c$

12. The solution of the differential equation $y' = -x^2 + 2x$ satisfying the condition $y(2) = 1$ is

(a) $y = \frac{-x^3}{3} + x^2 - \frac{1}{3}$ (correct)

(b) $y = \frac{-x^3}{3} + x^2 + \frac{1}{3}$

(c) $y = -x^3 + x^2 - \frac{1}{3}$

(d) $y = -x^3 - x^2 + \frac{1}{3}$

(e) $y = \frac{-x^3}{3} + x - \frac{1}{3}$

13. If $y = \dfrac{x^2(1+x^2)}{\sqrt{x^2+3}}$, then $y'(1) =$

(a) $\dfrac{11}{4}$ (correct)

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

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

(d) $\dfrac{9}{4}$

(e) 3

14. For a monopolist's product, the demand function is $p = \dfrac{40}{\sqrt{q}}$, and the average-cost function is $\bar{c} = \frac{1}{3} + \frac{2000}{q}$, then the profit-maximizing output q is:

(a) 3600 (correct)

(b) 2500

(c) 1600

(d) 3000

(e) 2000

15. By using differential $\sqrt[3]{9} \approx$

(a) $\frac{25}{12}$ ——————————————————————————————(correct)

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

(c) $\frac{23}{12}$

(d) $\frac{8}{3}$

(e) 2