

F.4 Mathematics

MC Exercise

4B7 Exponential Functions

1. $(\sqrt[3]{27^{-2}})^{100} (9^{50})^4 =$

- A. 1.
- B. 3^{200} .
- C. 3^{600} .
- D. $3^{1\ 820}$.

2. $1\ 331^{3^{-2}} =$

- A. 11^{27} .
- B. $\frac{1}{11^{27}}$.
- C. $11^{\frac{1}{3}}$.
- D. $\frac{1}{11^{\frac{1}{3}}}$.

3. If y is a natural number, then $(9^y)^{\frac{1}{y}} =$

- A. $3^{\frac{4}{y^2}}$.
- B. $3^{\frac{4}{y^4}}$.
- C. $9^{\frac{1}{y^2}}$.
- D. $9^{\frac{4}{y^2}}$.

4. If $a > 0$, then $\frac{\sqrt{a^3}}{\sqrt[3]{a^2} \cdot a^{-\frac{5}{4}}} =$

- A. $a^{-\frac{5}{2}}$.
- B. $a^{\frac{11}{12}}$.
- C. $a^{\frac{13}{12}}$.
- D. $a^{\frac{25}{12}}$.

5. If $a > 0$ and $b > 0$, then $(a^{\frac{3}{4}} \cdot \sqrt[3]{b}) \div \frac{\sqrt{a^5}}{b^{\frac{2}{5}}} =$

- A. $a^{-\frac{7}{4}} b^{\frac{11}{15}}$.
- B. $a^{-\frac{7}{4}} b^{-\frac{1}{15}}$.
- C. $a^{\frac{13}{14}} b^{-\frac{1}{15}}$.
- D. $a^{\frac{13}{4}} b^{\frac{11}{15}}$.

6. If $a > 0$ and $b > 0$, then

$$\left(\frac{\sqrt{256a^{\frac{2}{3}}}}{b^{\frac{5}{6}}} \right) \left(\frac{8a^{\frac{5}{2}}}{b^2} \right)^{-\frac{1}{3}} =$$

- A. $8a^{\frac{1}{2}} b^{\frac{1}{6}}$.
- B. $\frac{8a^{\frac{1}{2}}}{b^{\frac{1}{6}}}$.
- C. $\frac{8b^{\frac{1}{6}}}{a^{\frac{1}{2}}}$.
- D. $\frac{8}{a^{\frac{1}{2}} b^{\frac{1}{6}}}$.

7. If n is a natural number, then $\sqrt[5]{\frac{125^{2n+1}}{5 \cdot 25^{\frac{n}{2}+1}}} =$

- A. $5^{\frac{6}{5}}$.
- B. 5^n .
- C. 5^{5n} .
- D. $5^{\frac{25n+1}{5}}$.

8. If $c > 0$ and n is a natural number, then

$$\left(\frac{36c^{\frac{n}{n+4}}}{c^{\frac{n}{n-4}}} \right)^{\frac{1}{2}} =$$

- A. 6.
 B. $6c^{\frac{n^2}{n^2-16}}$.
 C. $6c^{\frac{4n}{16-n^2}}$.
 D. $6c^{\frac{8n}{n^2-16}}$.

9. If n is a rational number, then

$$\frac{3^{n+2} - 27(3^{n-2})}{9(3^n)} =$$

- A. $\frac{2}{3}$.
 B. $\frac{1}{9}$.
 C. 3^{2n-4} .
 D. $\frac{1}{3^{n+1}}$.

10. If $x > 0$, m and n are natural numbers, then

$$\sqrt[n]{x^m (\sqrt[m]{x^n})} =$$

- A. $x^{\frac{m^2+n}{mn}}$.
 B. $x^{\frac{m+n^2}{mn}}$.
 C. $x^{\frac{m^2+n^2}{mn}}$.
 D. $x^{\frac{m+n}{mn}}$.

11. If $a = 7^{\frac{k}{m}}$, k and m are natural numbers, then

$$\sqrt[3m]{7^{\frac{3k}{2}}} =$$

- A. $\sqrt{a}$.
 B. $\sqrt[3]{a}$.
 C. a .
 D. $3a$.

12. If $a = 2^{\frac{3}{5}}$ and $b = 3^{-3}$, then $6^{30} =$

- A. $a^{\frac{1}{18}} b^{-\frac{1}{90}}$.
 B. $a^{\frac{1}{50}} b^{-\frac{1}{10}}$.
 C. $a^{18} b^{-90}$.
 D. $a^{50} b^{-10}$.

13. If x is a rational number, then $2^x \cdot 3^{2x} \cdot 12^x =$

- A. 6^{3x} .
 B. 6^{4x} .
 C. 6^{6x} .
 D. 72^{4x} .

14. Arrange the following numbers in descending order.

$$55^{5^5}, (55^5)^5, 5^{5^{5^5}}$$

- A. $55^{5^5} > (55^5)^5 > 5^{5^{5^5}}$
 B. $55^{5^5} > 5^{5^{5^5}} > (55^5)^5$
 C. $5^{5^{5^5}} > 55^{5^5} > (55^5)^5$
 D. $5^{5^{5^5}} > (55^5)^5 > 55^{5^5}$

15. Solve the equation $\frac{7}{5} x^{\frac{2}{3}} = 35$ for $x > 0$.

- A. $x = 5$
 B. $x = 25$
 C. $x = 125$
 D. $x = \frac{1}{125}$

16. If $\sqrt[4]{a^5} = a^{3x-2}$ for $a > 0$ and $a \neq 1$, find the value of x .

- A. $\frac{17}{8}$
- B. $\frac{13}{12}$
- C. $-\frac{1}{4}$
- D. $-\frac{7}{8}$

17. If $\sqrt[3]{3^{2x}} = 27^4$, then $x =$

- A. -2 .
- B. 6 .
- C. 18 .
- D. 24 .

18. If $8^{1-x} = \sqrt{32^{6x+2}}$, then $x =$

- A. 0 .
- B. $-\frac{1}{6}$.
- C. $-\frac{1}{9}$.
- D. $-\frac{4}{9}$.

19. If $\frac{1}{125^{x-2}} = \sqrt[3]{625^{\frac{x}{2}+3}}$, then $x =$

- A. $\frac{30}{7}$.
- B. $\frac{6}{11}$.
- C. $-\frac{2}{3}$.
- D. $-\frac{6}{7}$.

20. If $2^{2x+2} + 2^{2x-2} = 17$, then $x =$

- A. -1 .
- B. 0 .
- C. 1 .
- D. 2 .

21. Solve the equation $\sqrt[3]{x \cdot \sqrt[3]{x}} = 16$ for $x > 0$.

- A. $x = 1\,024$
- B. $x = 512$
- C. $x = 256$
- D. $x = 128$

22. If $4^{x+1} - 3(2^{2x}) = 64$, then $x =$

- A. 8 .
- B. 6 .
- C. 4 .
- D. 3 .

23. If $7(2^{2x-3}) + 2^{2x+1} - 13(4^{x-2}) = 528$, then $x =$

- A. 4 .
- B. 3 .
- C. 2 .
- D. 1 .

24. Solve the simultaneous equations

$$\begin{cases} \frac{343^{\frac{x}{3}-1}}{7^{4-y}} = \frac{1}{49} \\ \frac{125^{5-2y}}{25^{x-2}} = 5 \end{cases}$$

- A. $x = -3, y = -2$
- B. $x = -3, y = 2$
- C. $x = 3, y = -2$
- D. $x = 3, y = 2$

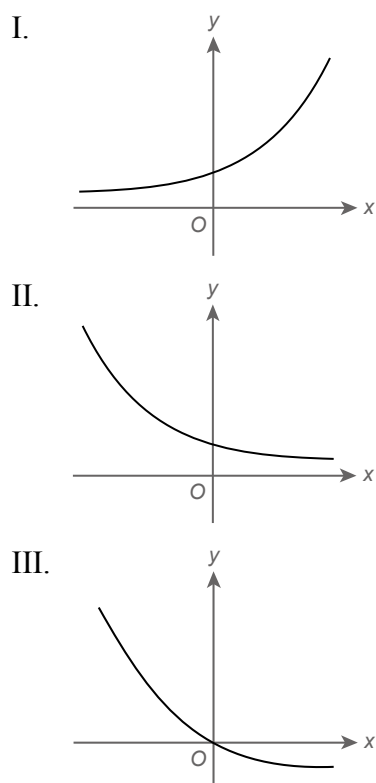
25. If $3^x = 2^y = 6^z$ where x, y and z are non-zero constants, find the value of $\frac{z}{x} + \frac{z}{y}$.

A. $\frac{2}{3}$
 B. 1
 C. $\frac{3}{2}$
 D. 2

26. If $f(x) = \left(\frac{1}{3}\right)^x$ and $g(x) = 3^{-x}$, which of the following must be true?

I. $f(x)g(x) = 1$
 II. $f(x)g(-x) = 1$
 III. $\frac{f(x)}{g(x)} = 1$
 A. I only
 B. I and III only
 C. II and III only
 D. I, II and III

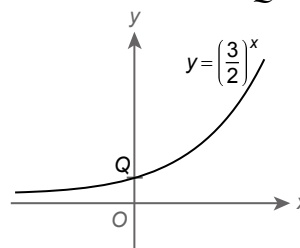
27. It is given that a is a positive constant and not equal to 1. Which of the following may represent the graph(s) of $y = a^x$?



A. I only
 B. II only
 C. I and II only
 D. I, II and III

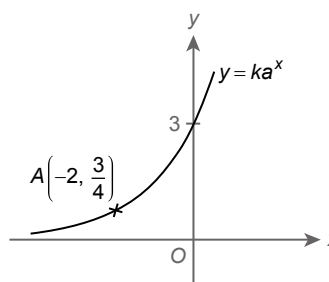
28. The figure shows the graph of $y = \left(\frac{3}{2}\right)^x$.

The coordinates of Q are



A. $\left(0, \frac{3}{2}\right)$.
 B. $\left(\frac{3}{2}, 0\right)$.
 C. $(0, 1)$.
 D. $(1, 0)$.

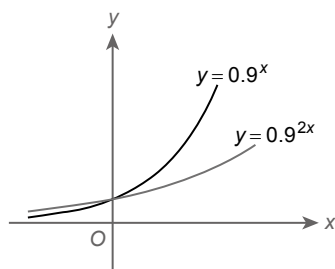
29. In the figure, the graph of $y = ka^x$ passes through $A\left(-2, \frac{3}{4}\right)$ and has the y -intercept 3, where $a > 1$ and $k > 1$. Find the value of a .



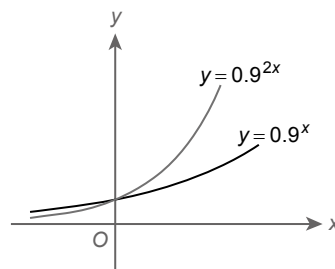
A. 2
 B. 3
 C. 4
 D. 5

30. Which of the following may represent the graphs of $y = 0.9^x$ and $y = 0.9^{2x}$?

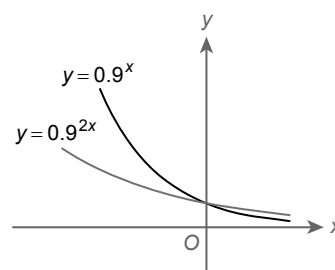
A.



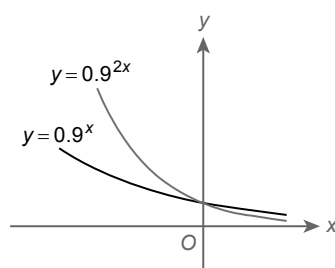
B.



C.



D.

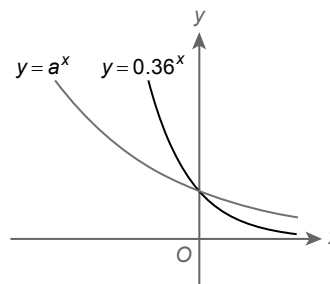


31. Suppose $a > 0$ and $a \neq 1$. Which of the following statements about the function $y = a^x$ must be true?

- I. The domain of the function is all real numbers.
- II. The range of the function is $y \geq 0$.
- III. The graph of the function lies above the x -axis.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

32. The figure shows the graphs of $y = 0.36^x$ and $y = a^x$. Find the range of values of a .



- A. $a < 0$
- B. $0 < a < 0.36$
- C. $0.36 < a < 1$
- D. $a > 1$

33. If $4^m + 4^{-m} = x$ where $m > 0$ and $x > 4$, then $2^m - 2^{-m} =$

- A. $\sqrt{x - 2}$.
- B. $\pm \sqrt{x - 2}$.
- C. $\sqrt{x} + 2$.
- D. $\sqrt{x} - 2$.

34. The value $\$V$ of a motorcycle after t years is given by $V(t) = 13\,000(2.1^{-0.14t})$. Find the percentage decrease of its value in the next 3 years correct to 3 significant figures.

- A. 73.2%
- B. 36.6%
- C. 34.0%
- D. 26.8%

35. The volume $V(t)$ (in cm^3) of a balloon after t minutes is given by $V(t) = 24k^{t-1}$, where k is a positive constant. It is known that the volume of the balloon is 27.6 cm^3 after 2 minutes. Find the increase in the volume of the balloon in the fourth minute correct to 3 significant figures.

- A. 4.76 cm^3
- B. 5.48 cm^3
- C. 8.90 cm^3
- D. 14.4 cm^3

