

1. Given that
 $10^x = 200$

What is the logarithmic form of the given exponential form?

- A) $x = \log 200$
- B) $200 = \log x$
- C) $10 = \log x$
- D) $x = \log 10$

2. Given that
 $\log(2x - 100) = 1$

What is the value of x ?

- A) $x = 10$
- B) $x = 55$
- C) $x = 50.5$
- D) $x = 1$

3. Solve for x !
 $\log_3 3x = 2$

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

4. Write as a single logarithm $2 + \log_3 2$

- A) $\log_3 18$
- B) $\log_3 11$
- C) $\log_3 3$
- D) $\log_3 4$

5. Given that $p = \log_5 x$, find $\frac{\log_3 \left(\frac{125}{x^2} \right)}{\log_3 5}$

- A) $3 + 2p$
- B) $3 - 2p$
- C) $2 + 2p$
- D) $2 - 2p$

6. Calculate $\log_2 6 + \log_2 8 - \log_2 3$

- A) 4
- B) 2
- C) 5
- D) 3

7. What is the single logarithm of the expression $2 \log_3 8 - 5 \log_3 2$

- A) $\log_3 32$
- B) $-3 \log_3 4$
- C) $-3 \log_3 6$
- D) $\log_3 2$

8. Simplify $3 \ln 4 + \frac{1}{2} \ln 9 - \ln 12$

- A) $\ln 16$
- B) $\ln 3$
- C) $\ln 4$
- D) $\ln 9$

9. Solve the simultaneous equations

$$xy = 81$$

$$\log_x y = 3$$

- A) $x = -3, y = 2$
- B) $x = 5, y = 0$
- C) $x = 3, y = 27$
- D) $x = 9, y = 20$

10. Solve $\log_x 36 + \log_x 4 = 2$.

- A) 15
- B) 19
- C) 12
- D) 17

11. Solve $(\frac{3}{4})^x > 5$

- A) $x < \frac{\log(\frac{3}{4})}{\log 5}$
- B) $x > \frac{\log 5}{\log(\frac{3}{4})}$
- C) $x > \frac{\log(\frac{3}{4})}{\log 5}$
- D) $x < \frac{\log 5}{\log(\frac{3}{4})}$

12. Solve $5^{2x+3} > 30$

- A) $x > \frac{1}{2}(\frac{\log 30}{\log 5} - 3)$
- B) $x > 2(\frac{\log 30}{\log 5} - 3)$
- C) $x > 2(3 - \frac{\log 30}{\log 5})$
- D) $x > \frac{1}{2}(3 - \frac{\log 30}{\log 5})$

13. Solve, giving your answers in terms of natural logarithms

$$e^{2x-1} = 6$$

- A) $\frac{1}{2}(1 + \ln 6)$
 B) $\frac{1}{3}(1 - \ln 6)$
 C) $\frac{1}{3}(1 + \ln 6)$
 D) $\frac{1}{2}(1 - \ln 6)$

14. Find solution of the equation below!
 $\ln(5x - 9) = \ln(x + 3) + \ln 2$

- A) $x = 3$
 B) $x = 5$
 C) $x = 7$
 D) $x = 1$

15. Convert $x \cdot 10^y = 3$ into the form $Y = mX + c$.

- A) $y = -\log(x) + \log(3)$
 B) $y = \log(x) - 3$
 C) $y = \log(x) + \log(3)$
 D) $y = -\log(x) - 3$

16. When the equation $y = a \cdot x^n$ is converted into linear form, the graph of $\ln(y)$ against $\ln(x)$ is a straight line passing through the points $(0.31, 4.02)$ and $(1.83, 3.22)$.

What is the value of n correct to 2 decimal places?

- A) -1.9
 B) -0.53
 C) 4.3
 D) 0.23

17. Find the exact value of $\cot\left(\frac{2\pi}{3}\right)$

- A) $\sqrt{3}$
- B) $-\frac{1}{\sqrt{3}}$
- C) $\frac{1}{\sqrt{3}}$
- D) $-\sqrt{3}$

18. Solve the equation $3 \sec x - 4 = 0$ for $0^\circ \leq x \leq 360^\circ$

- A) 41.4° or 221.4°
- B) 41.4° or 138.6°
- C) 41.4° or 318.6°
- D) 41.4° or 311.4°

19. Given that $\sin x = \frac{2}{3}$ and $\cos y = \frac{3}{5}$

What is the result of $\sin(x - y)$?

- A) $\frac{2-5\sqrt{3}}{5}$
- B) $\frac{6-4\sqrt{5}}{15}$
- C) $2\sqrt{3}$
- D) $\frac{2-\sqrt{2}}{3}$

20. What is the simplest form of the following expression?
 $\cos 3\theta \cos(-4\theta) + \sin 3\theta \sin(-4\theta)$

- A) $\cos -\theta$
- B) $\cos 7\theta$
- C) $\sin 7\theta$
- D) $\sin -\theta$

21. Given that $\cos 2x = -\frac{527}{625}$ and that $0^\circ < x < 90^\circ$ find the exact value of $\sin 2x$

- A) $-\frac{336}{527}$
 B) $\frac{336}{625}$
 C) $\frac{336}{527}$
 D) $-\frac{336}{625}$

22. Express each of the following as a single trigonometric ratio

$$\frac{2\tan 17^\circ}{1 - \tan^2 17^\circ}$$

- A) $\frac{1}{\tan 34^\circ}$
 B) $\frac{1}{\tan 17^\circ}$
 C) $\tan 17^\circ$
 D) $\tan 34^\circ$

23. Write as a single trigonometry!
 $\cos(2x) - \cos^2 x = \dots$

- A) $-\cos^2 x$
 B) $-\sin^2 x$
 C) $\cos^2 x$
 D) $\sin^2 x$

24. Express $4\sin\theta + 3\cos\theta$ in the form $R\sin(\theta + \alpha)$.

- A) $7\sin(\theta - 36.87^\circ)$
 B) $5\sin(\theta - 36.87^\circ)$
 C) $5\sin(\theta + 36.87^\circ)$
 D) $7\sin(\theta + 36.87^\circ)$

25. It's known that $4\sin\theta + 3\cos\theta$ can be written in the form $5\sin(\theta + 36.87^\circ)$,

solve the equation

$$4\sin\theta + 3\cos\theta = 2 \text{ for } 0^\circ \leq \theta < 360^\circ$$

- A) $\theta = 346.71^\circ$ only
 B) $\theta = 119.55^\circ$ only
 C) $\theta = 23.58^\circ$ or $\theta = 156.42^\circ$
 D) $\theta = 346.71^\circ$ or $\theta = 119.55^\circ$

26. Find $\frac{dy}{dx}$ when $y = 5x(4x + 2)^5$

- A) $\frac{dy}{dx} = 10(4x + 2)^5(12x + 1)$
 B) $\frac{dy}{dx} = 10(4x + 2)^4(12x + 1)$
 C) $\frac{dy}{dx} = 10(4x + 2)^5(12x + 1)^2$
 D) $\frac{dy}{dx} = 10(4x + 2)^4(12x + 10)$

27. Find the gradient of the curve $y = \frac{x^2+1}{x+2}$ at the point (-1, 2)

- A) 4
 B) -4
 C) $-\frac{1}{4}$
 D) $\frac{1}{4}$

28. Differentiate $\frac{\sin x}{x^2}$ with respect to x.

- A) $\frac{2\cos x - x\sin x}{x^3}$
 B) $\frac{x\sin x - 2\cos x}{x^3}$
 C) $\frac{x\cos x - 2\sin x}{x^3}$
 D) $\frac{2\sin x - x\cos x}{x^3}$

29. Differentiate e^{2x-7}

- A) $\frac{1}{2}e^{2x-7}$
- B) $2e^{2x-7}$
- C) $2e^x$
- D) $\frac{1}{2}e^x$

30. Differentiate $y = e^{-2x} + 2e^{3x}$ with respect to x

- A) $\frac{dy}{dx} = 3e^{3x} - 2e^{-2x}$
- B) $\frac{dy}{dx} = 3e^{3x} - e^{-2x}$
- C) $\frac{dy}{dx} = 2(3e^{3x} - e^{-2x})$
- D) $\frac{dy}{dx} = 2e^{3x} - 6e^{-2x}$

31. Let's $f(x) = \ln(x^2)$, then $f'(-6) = \dots$

- A) $f'(-6) = \frac{1}{36}$
- B) $f'(-6) = -\frac{1}{3}$
- C) $f'(-6) = \frac{1}{3}$
- D) $f'(-6) = -\frac{1}{18}$

32. Find $\frac{dy}{dx}$ of the function given by $x^2y + y^2 = 3x$ using implicit differentiation.

- A) $\frac{dy}{dx} = \frac{2xy-3}{x^2+2y}$
- B) $\frac{dy}{dx} = -\frac{2xy+3}{x^2+2y}$
- C) $\frac{dy}{dx} = \frac{-2xy+3}{x^2+2y}$
- D) $\frac{dy}{dx} = -\frac{2xy-3}{x^2-2y}$

33. The parametric equations of a curve are $x = 3t$,
 $y = t^2 - 5t$. Find the value of t for which the curve has
 gradient 0.

- A) 2
- B) 2.5
- C) 5.5
- D) 5

34. Give the parametric equations:
 $x = 2\theta - \sin 2\theta$

$$y = 2 - \cos 2\theta$$

find $\frac{dy}{dx}$ in term of the given perimeter!

- A) $\frac{\cos \theta}{1 + \sin 2\theta}$
- B) $\frac{\sin 2\theta}{1 - \cos 2\theta}$
- C) $\frac{\cos 2\theta}{1 - \sin 2\theta}$
- D) $\frac{\cos 2\theta}{1 + \sin 2\theta}$

35. If $h(x) = \ln(e^x - 1)$ and $h'(x) = 4$ are given. What
 is possible value of x ?

- A) $x = \ln 4$
- B) $x = 0$
- C) $x = \ln \frac{4}{3}$
- D) $x = \ln \frac{3}{4}$

36. Find the value of
 $\log_7 \left(\frac{\sqrt[3]{7}}{7} \right)^2$

37. Solve $3^{2x} - 12(3^x) + 27 = 0$.

38. Prove the identity $\frac{1 + \sin(2\theta) - \cos(2\theta)}{2 \sin \theta} = \cos \theta + \sin \theta$

39. Find the gradient of the curve $y = x^2\sqrt{x+4}$ at the point $(-3, 9)$.

40. What is the gradient of the curve $x^2 - xy + y^2 = 7$ at $(3, 1)$?