

KCATM Advanced Math TEAM TEST 2012

1. If $f(x) = 3x - 5$ and $g(x) = x^2 - 3x + 1$, find $f(g(4))$.
 - a. 29
 - b. 35
 - c. 12
 - d. 10
 - e. None of the above
2. If $f(x) = 3x - 2$, find $f^{-1}(x)$.
 - a. $f^{-1} = 3x + 2$
 - b. $f^{-1} = \frac{x+2}{3}$
 - c. $f^{-1} = \frac{1}{3}x - 2$
 - d. $f^{-1} = 2 - 3x$
 - e. None of the above.
3. If $f(x)$ contains the point $(4, 1)$, then $f^{-1}(x)$ must contain what point?
 - a. $(-4, -1)$
 - b. $(-1, -4)$
 - c. $(1, 4)$
 - d. $(4, 1)$
 - e. None of the above
4. If $\frac{2x^2+kx+3}{x-3} = 2x - 1$, then find the value of k .
 - a. -7
 - b. 7
 - c. 6
 - d. -6
 - e. None of the above
5. Simplify the expression $\sqrt{-175}$ using the imaginary number i .

a. $7i\sqrt{5}$	c. $i\sqrt{175}$
b. $7\sqrt{5}$	d. $5i\sqrt{7}$
6. Find $|-5 - 4i|$
 - a. -9
 - b. 9
 - c. $\sqrt{41}$
 - d. $\sqrt{20}$
7. Find the sum of the solutions for the equation $x^2 + 18x + 81 = 25$.
 - a. 18
 - b. -18
 - c. 0
 - d. None of the above.

8. Write a polynomial function in standard form with zeros at 5, -4, and 1.
- a. $f(x) = x^3 - 2x^2 - 19x - 9$ c. $f(x) = x^3 - 21x^2 + 60x - 9$
b. $f(x) = x^3 - 2x^2 - 19x + 20$ d. $f(x) = x^3 + 20x^2 - 2x - 19$
9. Divide $3x^3 - 3x^2 - 4x + 3$ by $x + 3$.
- a. $3x^2 - 12x + 32$ c. $3x^2 - 6x - 40$
b. $3x^2 - 12x + 32, R - 93$ d. $3x^2 - 6x - 40 R 99$
10. Evaluate $\log_5 \frac{1}{625}$.
- a. -3 c. -4
b. 5 d. 4
11. Solve $15^{2x} = 36$. Round to the nearest ten-thousandth.
- a. 0.6616 c. 1.7509
b. 2.6466 d. 1.9091
12. Solve $2\log 4 - \log 3 + 2\log x - 4 = 0$.
- a. 12.3308 c. 86.6025
b. 43.3013 d. 1875
13. Evaluate the series $1000 + 500 + 250 + \dots$ to S_5 .
- a. 968.75 c. 1937.5
b. 1062.5 d. 12,500
14. Convert $\frac{3\pi}{5}$ radians to degrees.
- a. $108\pi^\circ$ c. 108°
b. $\frac{\pi}{300}^\circ$ d. 1.88°
15. What is the domain of $\log_4(x - 4)$.
- a. $[4, \infty)$ c. $(-\infty, \infty)$
b. $(4, \infty)$ d. $[4, \infty)$
16. Simplify $3a^{\frac{1}{2}}b^{\frac{3}{2}} \cdot 2a^{\frac{3}{2}}b^{\frac{5}{2}}$
- a. $6a^{\frac{3}{4}}b^{\frac{15}{4}}$ c. $5a^2b^4$
b. $6a^2b^4$ d. None of the above
17. Evaluate $\frac{16!}{4!12!}$
- a. 10,920 c. 1820
b. 1 d. None of the above.
18. If \oplus is defined to be: $x \oplus y = x^y - 1$ and $x \oplus 5 = 31$, then $x = ?$
- a. 26 c. 6.4
b. 2 d. None of the above.
19. Expand $\log_a \frac{x^2y}{\sqrt[3]{z}}$ completely.
- a. $2\log_a x + \log_a y - \frac{1}{3}\log_a z$ c. $\log_a x^2 + \log_a y - \log_a \sqrt[3]{z}$
b. $\log_a \left(2x + y - \frac{1}{3}z\right)$ d. $2\log_a x + \log_a y + \frac{1}{3}z$

20. Evaluate $8^{\frac{1}{6}} \cdot 8^{\frac{1}{2}}$.
- a. ${}^{12}\sqrt{8}$ c. $\sqrt[8]{8}$
b. $8^{\frac{1}{4}}$ d. 4
21. $\sqrt{98} + \sqrt{50} - \sqrt{72}$
- a. $2\sqrt{220}$ c. $18\sqrt{2}$
b. $6\sqrt{2}$ d. $\sqrt{76}$
22. Find the domain of $f(x) = \frac{\cos x}{x+7}$.
- a. $(-\infty, \infty)$ c. $[-\infty, -7] \cup [-7, \infty]$
b. $(-\infty, 7) \cup (7, \infty)$ d. $(-\infty, -7) \cup (-7, \infty)$
23. Simplify i^{103} .
- a. i b. $-i$ c. 1 d. -1
24. Express $2 \log 3 + 4 \log y - 6 \log z - 8 \log t$ as a single log.
- a. $\frac{\log 9 \log y^4}{\log z^6 \log t^8}$ c. $\frac{\log 9y^4}{\log z^6 t^8}$
b. $\log \frac{9y^4}{z^6 t^8}$ d. None of the above.
25. Find the slope of the curve $y = 3x^3 - 4x^2 + 2x - 4$ at $x = 3$.
- a. 59 b. 47 c. Undefined d. None of the above.
26. Find the real number root of $\sqrt[3]{-\frac{125}{343}}$.
- a. $\frac{25}{49}$ b. $-\frac{125}{343}$ c. $-\frac{125}{1029}$ d. $-\frac{5}{7}$
27. Simplify the trigonometric function $\sec \theta \cos \theta$.
- a. $\tan \theta$ b. 1 c. $\cot \theta$ d. $\sin \theta$
28. Suppose that x and y vary inversely, and $x = 7$ when $y = 11$. Write the function that models the inverse variation.
- a. $y = 1.57 x$ c. $y = \frac{4}{x}$
b. $y = \frac{77}{x}$ d. $y = \frac{18}{x}$
29. Find the horizontal asymptote of the graph of $y = \frac{6x^2 + 5x + 9}{7x^2 - x + 9}$.
- a. $y = \frac{6}{7}$ c. $y = 1$
b. $y = 0$ d. No horizontal asymptote
30. Find the equation of the normal line to $y = x^2 - 3x + 4$ at $x = 3$.
- a. $y = 3x - 5$ c. $y = -\frac{1}{3}x + 5$
b. $y = \frac{1}{3}x + 3$ d. $y = -3x + 13$
31. Which of the following is the solution to $|x - 2| < 3$?
- a. $x = -1$ or $x = 5$ c. $[-1, 5]$
b. $(-\infty, -1) \cup (5, \infty)$ d. $(-1, 5)$

32. Which of the following functions is bounded both above and below?

a. $f(x) = x^2 - 4$

c. $f(x) = 3e^x$

b. $f(x) = 3 + \frac{1}{1 + e^{-x}}$

d. $f(x) = 4 - |x|$

33. Which of the following function is increasing on the interval $(-\infty, \infty)$?

a. $f(x) = \sqrt{3+x}$

c. $f(x) = 3 / \left(\frac{1}{1 + e^{-x}} \right)$

b. $f(x) = \int x$

d. $f(x) = \sin x$

34. Which ordered pair is not in the inverse of the relation given by $xy^2 - 3x = 12$?

a. (0, -4)

c. (3, 2)

b. (4, 1)

d. (1, -6)

35. What is the y-intercept of the graph of $f(x) = 2(x-1)^2 + 5$?

a. 3

c. 7

b. 5

d. 2

36. Ten liters of a 20% acid solution are mixed with 30 liters of a 30% acid solution. Which of the following is the percent of acid in the final solution?

a. 21%

c. 25%

b. 22.5%

d. 27.5%

37. Solve $\ln x = -1$.

a. $x = -1$

c. $x = \frac{1}{e}$

b. $x = e$

d. $x = 1$

38. Simplify $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$.

a. $-\frac{7\pi}{6}$

c. $-\frac{\pi}{3}$

b. $\frac{2\pi}{3}$

d. $\frac{5\pi}{6}$

39. Which of the following polar coordinate pairs represent the same point as the polar coordinates $(2, 110^\circ)$?

a. $(-2, -70^\circ)$

c. $(-2, 110^\circ)$

b. $(-2, 110^\circ)$

d. $(2, 290^\circ)$

40. The series $3^{-1} + 3^{-2} + 3^{-3} + \dots + 3^{-n} + \dots$

a. converges to $\frac{1}{2}$

c. converges to $\frac{1}{3}$

b. converges to $\frac{2}{3}$

d. diverges