

KCATM 2011
Graphing 10th & 11th grade

For questions 1-4, match the equation of the conic section with the name of the conic section.

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|--------------|----------------------------------|
| 1. Hyperbola | A. $x^2 - y^2 = 16$ |
| 2. Parabola | B. $x^2 + 4y^2 = 100$ |
| 3. Circle | C. $y^2 - 2x = 0$ |
| 4. Ellipse | D. $5x^2 + 5y^2 + 20x + 40y = 7$ |

For questions 5-8, match the equation of the function with the word that best describes it.

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|------------------|-----------------------------|
| 5. Polynomial | A. $f(x) = 3\sin(2x)$ |
| 6. Rational | B. $f(x) = \frac{x+2}{x-1}$ |
| 7. Exponential | C. $f(x) = 3x^7 + 4x^2$ |
| 8. Trigonometric | D. $f(x) = 4(.78)^{2x-1}$ |

9. Write the equation of the line passing through the point (4, 7) and parallel to $x - 6 = 0$.

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|-------------|----------------------|-------------|
| (A) $x = 4$ | (B) $x = 7$ | (C) $y = 4$ |
| (D) $y = 7$ | (E) answer not given | |

10. Write the equation of the line passing through the point (1, 8) and perpendicular to $x + 2y = 5$.

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|-------------------------|------------------------|-------------------------|
| (A) $y - 8 = 2(x - 1)$ | (B) $y - 1 = 2(x - 8)$ | (C) $y - 1 = -2(x - 8)$ |
| (D) $y - 8 = -2(x - 1)$ | (E) answer not given | |

11. Write the equation of the parabola with vertex at (4, 8), passing through the point (7, 19).

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| (A) $y = \frac{8}{11}(x - 4) + 8$. | (B) $y = \frac{8}{11}(x - 4)^2 + 8$. | (C) $y = \frac{8}{11}(x - 7)^2 + 19$. |
| (D) $y = \frac{8}{11}(x - 7) + 19$. | (E) answer not given | |

12. Write the equation of the exponential function passing through the point (0, 7) and (2, 21).

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|----------------------|-------------------------|--------------------------|
| (A) $y = 7(3)^{x/2}$ | (B) $y = 7(\sqrt{3})^x$ | (C) $y = 7(-\sqrt{3})^x$ |
| (D) a, b are correct | (E) a, b, c are correct | |

13. Calculate the slope of the line: $4x + 7y = 17$.

- (A) $4/7$ (B) $-4/7$ (C) $7/4$
(D) $-7/4$ (E) answer not given

14. Calculate the x-intercept of the line: $4x + 7y = 17$.

- (A) $\left(\frac{17}{4}, 0\right)$ (B) $\left(0, \frac{17}{4}\right)$ (C) $\left(\frac{17}{7}, 0\right)$
(D) $\left(0, \frac{17}{7}\right)$ (E) answer not given

15. Calculate the y-intercept of the line: $4x + 7y = 17$.

- (A) $\left(\frac{17}{4}, 0\right)$ (B) $\left(0, \frac{17}{4}\right)$ (C) $\left(\frac{17}{7}, 0\right)$
(D) $\left(0, \frac{17}{7}\right)$ (E) answer not given

16. Calculate the horizontal asymptote for the function, $f(x) = e^x - 5$.

- (A) $f(x)$ doesn't have H.A. (B) $y = 5$ (C) $y = -5$
(D) $y = 0$ (E) answer not given

17. Calculate the horizontal asymptote for the function, $f(x) = \frac{1-5x}{x-3}$.

- (A) $f(x)$ doesn't have H.A. (B) $y = 5$ (C) $y = -5$
(D) $y = 0$ (E) answer not given

18. Calculate the removable discontinuity for the function, $f(x) = \frac{x^2 + 3x}{x^2 + 7x + 12}$.

- (A) $x = 0$ (B) $x = -3$ (C) $x = -4$
(D) $f(x)$ doesn't have one (E) none of the above

19. Calculate the vertical asymptote(s) for the function, $f(x) = \frac{x^2 - 1}{x^2 + 4x + 3}$.

(A) $x = 1$

(B) $x = -1$

(C) $x = -3$

(D) both b & c

(E) none of the above

For questions 20 – 24, suppose $y = 3\sin(4x - 7) + 1$.

20. Give the domain of the sinusoid.

(A) all real numbers

(B) $x > \frac{7}{4}$

(C) $\left(-\infty, \frac{7}{4}\right) \cup \left(\frac{7}{4}, \infty\right)$

(D) $[-3, 3]$

(E) $[-2, 4]$

21. Give the range of the sinusoid.

(A) all real numbers

(B) $x > \frac{7}{4}$

(C) $\left(-\infty, \frac{7}{4}\right) \cup \left(\frac{7}{4}, \infty\right)$

(D) $[-3, 3]$

(E) $[-2, 4]$

22. Give the amplitude of the sinusoid.

(A) 3

(B) 4

(C) $7/4$

(D) 1

(E) none of the above

23. Give the phase shift of the sinusoid.

(A) up 1

(B) right 7

(C) right $7/4$

(D) left 7

(E) left $7/4$

24. Give the period of the sinusoid.

(A) 4

(B) 3

(C) $\frac{2\pi}{3}$

(D) $\frac{\pi}{2}$

(E) $\frac{\pi}{4}$

For questions 25 – 29, suppose $y = 3x^4 - 11x^2 + 6$.

25. Compute the zeros of the function.

(A) $\pm\sqrt{3}$

(B) $\pm\sqrt{\frac{2}{3}}$

(C) no real zeros

(D) both a and b

(E) answer not given

26. Describe the end behavior of the function, using limit notation.

(A) $\lim_{x \rightarrow -\infty} f(x) = -\infty, \lim_{x \rightarrow \infty} f(x) = -\infty$

(B) $\lim_{x \rightarrow -\infty} f(x) = -\infty, \lim_{x \rightarrow \infty} f(x) = \infty$

(C) $\lim_{x \rightarrow -\infty} f(x) = \infty, \lim_{x \rightarrow \infty} f(x) = -\infty$

(D) $\lim_{x \rightarrow -\infty} f(x) = \infty, \lim_{x \rightarrow \infty} f(x) = \infty$

(E) answer not given

27. Determine the y-intercept of the function.

(A) (0, 3)

(B) $(0, \sqrt{3})$

(C) $(0, -\sqrt{3})$

(D) $\left(0, \sqrt{\frac{2}{3}}\right)$

(E) answer not given

28. Describe the function's symmetry.

(A) even

(B) odd

(C) conditional

(D) transitive

(E) no symmetry

29. What is the number of turning points for this function?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

For questions 30 – 34, suppose $y = \frac{x^3 - x}{x^2 + 7x + 6}$.

30. Give the equation for the function's horizontal asymptote.

- (A) $y = 1$ (B) $y = 0$ (C) $y = 6$
(D) there is no H.A. (E) answer not given

31. Give the equation for the function's slant asymptote.

- (A) $y = x$ (B) $y = x + 6$ (C) $y = x - 6$
(D) $y = -48x - 36$ (E) answer not given

32. Give the equation for the function's vertical asymptote.

- (A) $x = -6$ (B) $x = -1$ (C) $x = 0$
(D) both a and b (E) answer not given

33. Compute any x-intercepts.

- (A) (0, 0) (B) (1, 0) (C) (-1, 0)
(D) both a and b (E) a, b, and c

34. Compute any y-intercept(s).

- (A) (0, 0) (B) (0, 6) (C) both a and b
(D) there is no y-intercept (E) answer not given

35. Suppose $f(x) = -7 + 3x^2 + 14x$. Give the equation for the parabola's axis of symmetry.

- (A) $x = \frac{7}{3}$ (B) $x = -\frac{7}{3}$ (C) $x = \frac{14}{3}$
(D) $x = -\frac{14}{3}$ (E) answer not given

36. Suppose $f(x) = 3(5)^{-2x}$. Describe the graph of the function.

- (A) exponential decay, with initial value of 12
(B) exponential growth, with initial value of 12
(C) exponential decay, with initial value of 96
(D) exponential growth, with initial value of 96
(E) exponential decay, with initial value of 3

37. Find the vertical asymptote of $f(x) = -3 + \ln(x-4)$.

(A) $x = 4$

(B) $x = -4$

(C) $x = 3$

(D) $x = -3$

(E) answer not given

38. Given the logistic function, $f(x) = \frac{12}{1+2e^{-x}}$, find any horizontal asymptote(s).

(A) $y = 0$

(B) $y = 1$

(C) $y = 12$

(D) both a and b

(E) both a and c

39. Suppose $g(x) = 3f(x-4) + 7$, and that $f(x)$ contains the point $(1, 2)$. What point is definitely on the graph of $g(x)$?

(A) $(-3, 13)$

(B) $(5, 27)$

(C) $(-3, 27)$

(D) $(5, 13)$

(E) answer not given

40. Give the amplitude of the function, $y = -4\cos(\pi x - 7) - 14$.

(A) -4

(B) 4

(C) -7

(D) 7

(E) answer not given