Math Analysis CP- Semester 2 Review
You must show ALL your work.

1. Which function has a removable discontinuity?

A $f(x) = \frac{x}{x+3}$ B $f(x) = \frac{x^2-4}{x+2}$ C $f(x) = \frac{1}{x+3}$ D $f(x) = x^3 - 3$

2. For $f(x) = \frac{3}{x-4}$, what expression for a makes $\lim_{x \to \infty} f(x) = a$ correct?

F $-\infty$ G 0 H 3 J ∞

3. **TEAMS** The function $p(x) = -5x^3 + 47x^2 - 109x + 90$ approximates the number of students on the debate team from 2004 to 2010 where x is the number of years since 2000. Which of the following best approximates the relative maximum of the function?

A 5 B 15 C 97 D 10,880

4. Given the parent function $p(x) = x^3$, what translation occurs in the graph of $p(x) = (x - 7)^3$?

A down 7 units B up 7 units C left 7 units D right 7 units

5. Solve $\sqrt{6x - 2} = \sqrt{4x + 4}$.

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

6. Which describes the end behavior of the graph of $f(x) = 2x^3 - 5x + 1$?

F $\lim_{x \to -\infty} f(x) = \infty$, $\lim_{x \to \infty} f(x) = \infty$

G $\lim_{x \to -\infty} f(x) = -\infty$, $\lim_{x \to \infty} f(x) = -\infty$

H $\lim_{x \to -\infty} f(x) = -\infty$, $\lim_{x \to \infty} f(x) = \infty$

J $\lim_{x \to -\infty} f(x) = \infty$, $\lim_{x \to \infty} f(x) = -\infty$

7. What is the greatest possible number of real zeros of $f(x) = x^3 - 2x^2 - x + 1$?

A 1 B 2 C 3 D 4

8. What is the greatest possible number of turning points of $f(x) = 6x^4 + 11x^3 - x^2 + x$?

F 3 G 4 H 5 J 6

9. Divide $(x^3 + 5x^2 + 5x - 2)$ by $(x + 2)$ using synthetic division.

A $x^2 + 7x + 19 + \frac{36}{x+2}$ C $x^2 + 3x - 1$

B $x^2 + 4$ D $x^2 + 7x - 9 + \frac{16}{x+2}$

10. **PHYSICS** The height h in feet of a ball thrown into the air after t seconds is given by $h(t) = -16t^2 + 35t + 6$. Use synthetic substitution to find the height of the ball after 0.5 second.

F 19.5 ft G 21 ft H 25 ft J 26.5 ft

11. Find the remainder when $2x^3 + 6x^2 + 3x - 1$ is divided by $x - 1$. Is the binomial a factor of the polynomial?

A 0; yes B -2; no C 10; no D -1; yes

12. Which shows all the possible rational zeros of $f(x) = 4x^3 + 5x^2 - x + 2$?

F $\pm 1, \pm\frac{1}{2}, \pm\frac{1}{4}, \pm 2$

G $\pm 1, \pm\frac{1}{2}, \pm\frac{1}{4}$

H $\pm 1, \pm\frac{1}{2}, \pm 2, \pm 4$

J $\pm 1, \pm\frac{1}{4}, \pm 2$

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13. **FINANCE** For a period of x days, an account balance can be modeled by $f(x) = x^3 - x^2 - 8x$. When was the balance \$60?

A Day 5 **B** Day 8 **C** Day 9 **D** Day 10

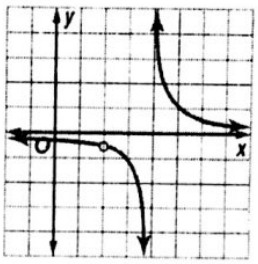
14. What are the vertical asymptotes of $f(x) = \frac{x^2 - 4}{x^2 - 9}$?

F $x = 0$ **G** $x = 1$ **H** $x = \pm 2$ **J** $x = \pm 3$

15. **MEDICINE** The concentration of a medicine is modeled by $f(x) = \frac{2x}{3x^2 + 1}$. What is the horizontal asymptote of the graph of the function?

A $y = -\frac{1}{3}$ **B** $y = 0$ **C** $y = \frac{2}{3}$ **D** $y = 2$

16. Which of the following could be the function represented by the graph?



F $f(x) = \frac{1}{x - 4}$ **H** $f(x) = \frac{x - 2}{(x - 2)(x - 4)}$

G $f(x) = \frac{x + 2}{x - 4}$ **J** $f(x) = \frac{x - 2}{(x - 2)(x + 4)}$

17. Solve $\frac{1}{x + 4} = \frac{1}{x^2 + 3x - 4} + \frac{4}{x - 1}$.

A –6 **B** –2 **C** 2 **D** 6

18. Which of the following is the solution to $(x + 3)(x - 2) \leq 0$?

F $(-\infty, \infty)$ **G** $(-\infty, 3)$ or $(2, \infty)$ **H** $(-2, 3)$ **J** $[-3, 2]$

19. Solve $\frac{6}{q} + 4 \geq \frac{3}{q}$.

A $(-\infty, \infty)$ **C** $(0, \infty)$

B $\left[-\frac{3}{4}, 0\right)$ **D** $(-\infty, -\frac{3}{4}]$ or $(0, \infty)$

20. Find the polynomial function of least degree with real coefficients in standard form that has the zeros –3, 0, and 3.

F $f(x) = x^3 + x^2 + 3x - 9$ **H** $f(x) = x^3 - 9x$

G $f(x) = x^3 + 9x$ **J** $f(x) = x^3 + x^2 - 3x - 9$

21. **TEMPERATURE** The low temperature for a city every other day is shown. Which function best models the data?

x	0	2	4	6	8	10	12	14	16	18	20
$f(x)$	2	5	5	4	2	0	–2	–2	0	5	14

A $f(x) = 0.2x^3 - 0.4x^2 + 2.2x + 2$

B $f(x) = 2x^3 - 40x^2 + 217x + 199$

C $f(x) = 0.02x^3 - 0.4x^2 + 2.17x + 1.99$

D $f(x) = 0.02x^3 - 4x^2 + 2.17x - 1.99$

22. Factor $x^3 - 10x^2 + 12x + 72$.

23. In 2008, the bird population in a certain area was 10,000. The number of birds increases exponentially at a rate of 9% per year. Predict the population in 2013.

A 15,386 **B** 15,683 **C** 15,489 **D** 15,771

24. A scientist has 86 grams of a radioactive substance that decays at an exponential rate. Assuming $k = -0.4$, how many grams of radioactive substance remain after 10 days?

F 21.5 g **G** 15.8 g **H** 3.7 g **J** 1.6 g

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25. Write $3^{-2} = \frac{1}{9}$ in logarithmic form.

A $\log_3(-2) = \frac{1}{9}$ **B** $\log_3 \frac{1}{9} = -2$ **C** $\log_{-2} \frac{1}{9} = 3$ **D** $\log_{-2} 3 = \frac{1}{9}$

26. Evaluate $\log_9 \frac{1}{27}$.

F $\frac{2}{3}$ **G** $\frac{3}{2}$ **H** $-\frac{2}{3}$ **J** $-\frac{3}{2}$

27. Solve $\log_4 x + \log_4(x - 2) = \log_4 15$.

A –3 only **B** 5 only **C** –3 or 5 **D** –5 or 3

28. Find the value of $\log_6 27.5$ using the Change of Base Formula.

A 0.661 **B** 1.439 **C** 1.850 **D** 2.232

29. Solve $5^x = 3^{x+2}$.

F 2.732 **G** 3.109 **H** 4.117 **J** 4.301

30. Convert $\log_5 47$ to a natural logarithm and evaluate.

F 0.770 **G** 2.241 **H** 2.392 **J** 2.516

31. Solve $e^{0.2x} = 21.2$.

A –1.898 **B** 4.663 **C** 8.234 **D** 15.270

32. Condense $3 \log x + \log 7 - 2 \log y$.

F $\log \frac{7x^3}{y^2}$ **G** $\log \frac{21x}{2y}$ **H** $\log \frac{21x}{y^2}$ **J** $\log 7x^3y^2$

33. Expand $\ln \frac{5x^6}{11y^7}$.

A $6 \ln 5x - 7 \ln 11y$
B $\ln 6 + \ln 5x - \ln 7 - \ln 11y$
C $\ln 5 + 6 \ln x - \ln 11 - 7 \ln y$
D $6 \ln 5x + 7 \ln 11y$

34. Express $\log \frac{125}{81}$ in terms of log 3 and log 5.

F 5 log 3 + 3 log 5
G 3 log 5 – 4 log 3
H 3 log 5 + 4 log 3
J 4 log 3 – 3 log 5

35. Solve $\ln x + \ln(x - 4) = \ln 12$.

A 6 **B** 6, –2 **C** –6, 2 **D** ln 6, ln –2

36. **BANKING** Find the amount of time required for an investment to double at a rate of 12.3% if the interest is compounded continuously.

A 5.635 years **B** 6.241 years **C** 7.770 years **D** 8.325 years

37. What is the augmented matrix for the given system?

$2x - 3y = -16$ $x + 5y = 18$

A $\begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ **B** $\begin{bmatrix} 5 & 3 \\ -1 & 2 \end{bmatrix}$ **C** $\left[\begin{array}{cc|c} 2 & -3 & -16 \\ 1 & 5 & 18 \end{array}\right]$ **D** $\left[\begin{array}{cc|c} 5 & 3 & -16 \\ -1 & 2 & 18 \end{array}\right]$

38. **FOOD** The table shows several boxes of assorted candy available at a candy shop. What is the price per pound for each candy?

Box	Chocolate	Taffy	Nougat	Price ($)
Grand Edition	10	5	0	12.25
Special Edition	10	5	5	16.25
Deluxe Edition	15	10	5	24.25

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39. What is the determinant of $\begin{bmatrix} 3 & -2 \\ 4 & 0 \end{bmatrix}$?

A –8 **B** 8 **C** 12 **D** 20

40. Find DE if $D = \begin{bmatrix} -2 & 4 & 6 \\ 5 & -7 & -1 \end{bmatrix}$ and $E = \begin{bmatrix} 1 & -2 \\ 0 & 4 \\ -3 & 4 \end{bmatrix}$.

F $\begin{bmatrix} -20 & 44 \\ 8 & -42 \end{bmatrix}$ **G** $\begin{bmatrix} -2 & -10 \\ 0 & -28 \\ -18 & -4 \end{bmatrix}$ **H** $\begin{bmatrix} -20 & 8 \\ 44 & -42 \end{bmatrix}$ **J** $\begin{bmatrix} -2 & 0 & 18 \\ -10 & 28 & 4 \end{bmatrix}$

41. Find the inverse of $\begin{bmatrix} 3 & -1 \\ -4 & 1 \end{bmatrix}$, if it exists.

A does not exist **B** $\begin{bmatrix} -1 & -1 \\ -4 & -3 \end{bmatrix}$ **C** $\begin{bmatrix} 1 & 1 \\ 4 & 3 \end{bmatrix}$ **D** $\begin{bmatrix} -1 & 1 \\ 4 & -3 \end{bmatrix}$

42. What is B if $A = \begin{bmatrix} 3 & -2 \\ 1 & -4 \end{bmatrix}$ and $AB = \begin{bmatrix} -4 & -6 \\ 2 & -12 \end{bmatrix}$?

F $\begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix}$ **G** $\begin{bmatrix} -2 & 0 \\ -1 & 3 \end{bmatrix}$ **H** $\begin{bmatrix} -2 & 0 \\ 1 & 3 \end{bmatrix}$ **J** $\begin{bmatrix} -2 & 0 \\ -1 & -3 \end{bmatrix}$

43. Solve the following system of equations using an inverse matrix.

$-4x - 2y + z = 6$ $-x - y - 2z = -3$ $2x + 3y - z = -4$

A (1, 0, –2) **B** (–1, 0, –2) **C** (–1, 0, 2) **D** (1, 0, 2)

44. **FUNDRAISING** The cheerleading squad is raising money for new uniforms by selling popcorn balls and calendars. Tanya raised $70 by selling 25 popcorn balls and 30 calendars. Nichole raised $53 by selling 20 popcorn balls and 22 calendars. What is the cost of one calendar?

A $1 **B** $1.25 **C** $1.50 **D** $1.75

45. Find the next two terms of the sequence 10, –11, –32, … .

F –53, –74 **G** –43, –54 **H** –42, –53 **J** –22, –12

46. Find the 27th term in the arithmetic sequence –8, 1, 10, … .

A 174 **B** 226 **C** 235 **D** 242

47. In an arithmetic sequence, what is d if $a1$ is 14 and $a_{24} = 50.8$?

F 1.6 **G** 2.1 **H** 2.6 **J** 3.6

48. Find the sum of the first 36 terms in the arithmetic series –0.2 + 0.3 + 0.8 + … .

A 318.6 **B** 332.2 **C** 307.8 **D** 315

49. **SALARY** An employee's salary increases by the same amount each year. If he earned $77,900 for the seventh year and $97,500 for the fifteenth year, how much was his pay for the second year?

F $61,100 **G** $63,200 **H** $63,900 **J** $65,650

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50. Which are the two geometric means between 175 and 1.4?

F 0.2, 0.04 **G** 1.4, 0.0112 **H** 35, 7 **J** 131.25, 65.625

51. Find the sum of $\sqrt{27} + \sqrt{9} + \sqrt{3} + \ldots$.

A $\frac{1}{2}(9 + 9\sqrt{3})$ **B** $9 + 9\sqrt{3}$ **C** $\frac{1}{2}(9 - 9\sqrt{3})$ **D** does not exist

52. **APPRECIATION** Each year, the value of a trading card increases by 4.8%. If the card was worth \$155 in 2009, what will its value be in 2021?

F \$247.71 **G** \$259.60 **H** \$272.06 **J** \$285.12

53. Suppose in a proof of $7 + 9 + 11 + \ldots + 2n + 5 = n(n + 6)$ by mathematical induction, you show the formula valid for $n = 1$. Assume that it is valid for $n = k$. What is the next equation in this proof?

A $7 + 9 + 11 + \ldots + 2k + 5 + 2(k + 1) + 5 = k(k + 6) + (k + 1)(k + 1 + 6)$

B $7 + 9 + 11 + \ldots + 2(k + 1) + 5 = k(k + 6)$

C $7 + 9 + 11 + \ldots + 2k + 5 = k(k + 6)$

D $7 + 9 + 11 + \ldots + 2k + 5 + 2(k + 1) + 5 = k(k + 6) + 2(k + 1) + 5$

54. What is the fifth term in the expansion $(3x - 2y)^6$?

F $240xy^4$ **G** $-32y^5$ **H** $-576xy^5$ **J** $2160x^2y^4$

55. The expression $243c^5 + 810c^4d + 1080c^3d^2 + 720c^2d^3 + 240cd^4 + 32d^5$ is the expansion of which binomial?

A $(3c + d)^5$ **B** $(c + 2d)^5$ **C** $(2c + 3d)^5$ **D** $(3c + 2d)^5$

56. **SPORTS** The probability that Kelly makes a free throw is 0.85. What is the approximate probability that she makes at least 8 of her next 10 attempts?

F 61% **G** 68% **H** 72% **J** 82%

Write the letter for the correct answer in the blank at the right of each question. CARS The table shows the number of cars sold by 20 salespeople in one week.

Number of Cars									
10	7	6	9	7	3	5	6	8	4
8	2	7	5	7	9	11	5	7	10

57. Which best describes the shape of the distribution?

A fairly symmetric **C** positively skewed
B bimodal **D** negatively skewed

58. What is the median of the data?

F 6.8 **G** 6 **H** 7 **J** 7.5

59. What is the mean of the data?

A 6.5 **B** 6.8 **C** 7 **D** 7.2

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60 61

For Questions ~~4~~ and ~~5~~, use the probability distribution.

X	1	2	3	4	5	6
P(X)	0.15	0.20	0.18	0.22	0.13	0.12

60. What is the mean of the distribution?
F 1.58 **G** 3 **H** 3.34 **J** 13.66

61. What is the standard deviation of the distribution?
A 1.58 **B** 2.50 **C** 3 **D** 3.34

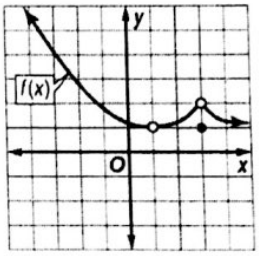
62. **INVESTMENT** If an investment of $10,000 is successful, the investor makes $50,000. Otherwise, he or she loses everything. Which is the expected value if the probability of success is 40%?
F $4000 **G** $6000 **H** $10,000 **J** $14,000

63. What is z if $X = 237$, $\mu = 220$, and $\sigma = 12.3$?
A –4.55 **B** –1.38 **C** 1.38 **D** 4.55

64 65

For Questions ~~1~~ and ~~2~~, use the graph of $y = f(x)$ below to find each value.

64. $\lim_{x \to 1} f(x)$
A 0 **C** 2
B 1 **D** 3



65. $\lim_{x \to 3^+} f(x)$
F 3 **G** 2 **H** 1 **J** 0

66. **MOTOR HOME** After t years, the value v of a motor home purchased for $150,000 is $v(t) = 150{,}000(0.92)t$. Estimate $\lim_{t \to \infty} v(t)$.
A $150,000 **B** $100,000 **C** $75,000 **D** $0

Evaluate each limit.

67. $\lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4}$
F $\frac{1}{4}$ **G** $\frac{1}{2}$ **H** 1 **J** 0

68. $\lim_{x \to \infty} \frac{3x^2 - 2x}{5x^3 + 7x^2}$
A ∞ **B** $\frac{3}{5}$ **C** 0 **D** $-\infty$

69. $\lim_{x \to -\infty} 2x^3 - x^2 + 3$
F $-\infty$ **G** 2 **H** 3 **J** ∞

70. Find the slope of the line tangent to the graph of $y = x^3 - 1$ at the point $(-2, -9)$.
A 12 **B** 9 **C** –9 **D** –12

71. Find an equation for the slope of the graph of $y = -2x^2 + 5x$ at any point.
F $m = -4$ **G** $m = 5$ **H** $m = -4x$ **J** $m = -4x + 5$

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72. **FALLING OBJECTS** Kyle drops a golf ball from a 1600-foot building. The position of the golf ball after t seconds is given by $s(t) = -16t^2 + 1600$. How fast is the golf ball falling after 3 seconds?

A –32 ft/s **B** –96 ft/s **C** –144 ft/s **D** 1456 ft/s

Find the derivative of each function.

73. $f(x) = x^3 - x$

A $3x^2 - x$ **B** $3x - 1$ **C** $3x^2$ **D** $3x^2 - 1$

74. $f(x) = (4x - 5)^2$

F $4x - 5$ **G** $8x - 10$ **H** $32x$ **J** $32x - 40$

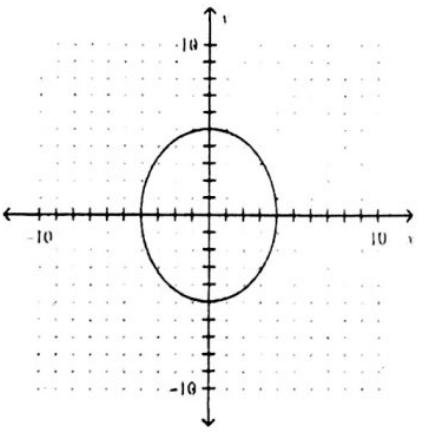
75. **HEIGHT** The height of a ball in feet after t seconds is given by $h(t) = 80t - 16t^2 + 10$ for $0 \le t \le 5$. Find $h'(2.5)$.

A 110 ft/s **B** 5 ft/s **C** 0 ft/s **D** –110 ft/s

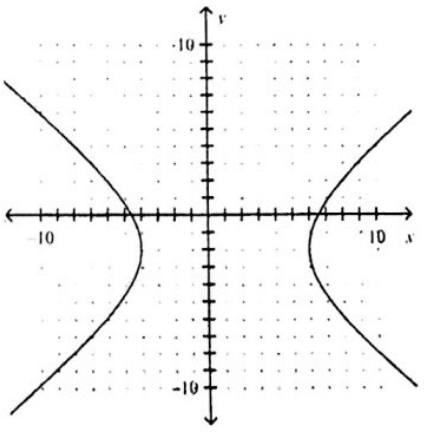
76. Sketch a complete graph of the conic section.

$$\frac{(x+1)^2}{25} - \frac{(y-2)^2}{16} = 1$$

a.



c.



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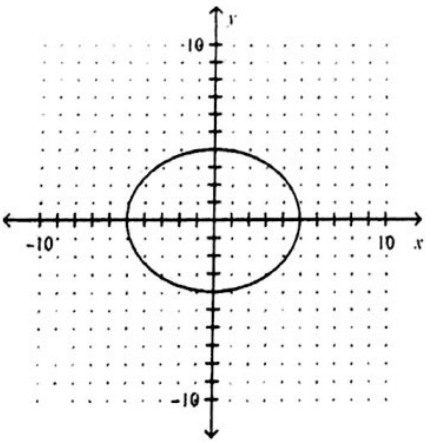

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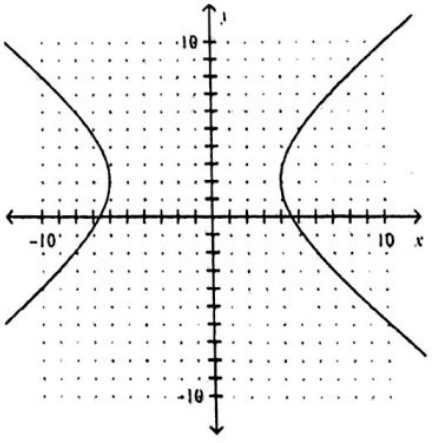

77. Use row reduction to solve the system of equations.

$x - 2y + z = 4$

$3x - 5y - 17z = 3$

$2x - 6y + 43z = -5$

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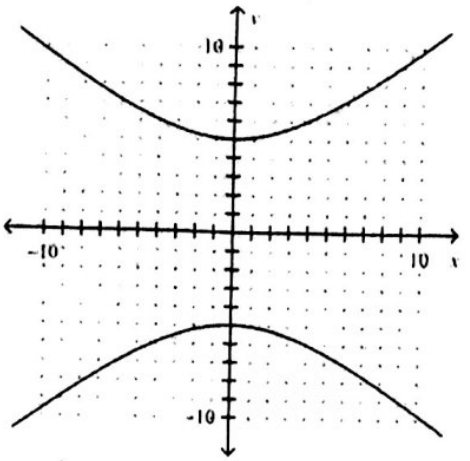
78. Which is the graph of the equation $36x^2 - 25y^2 = 900$?

a.



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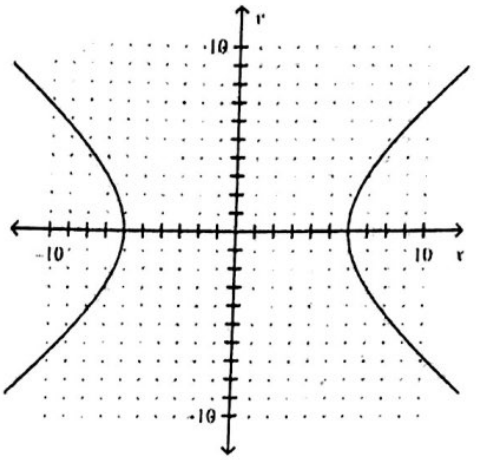

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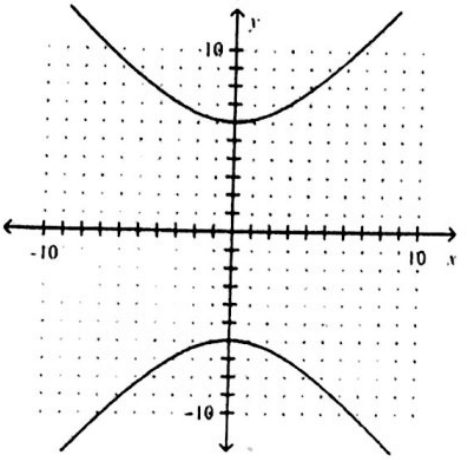

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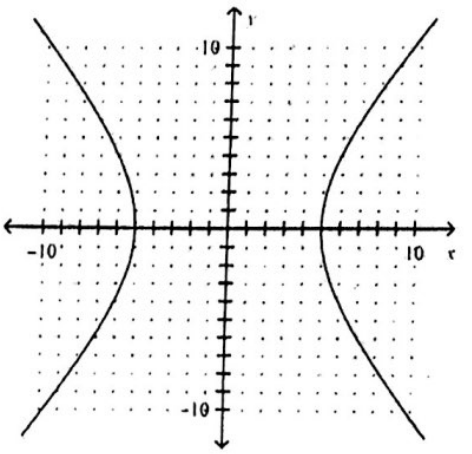
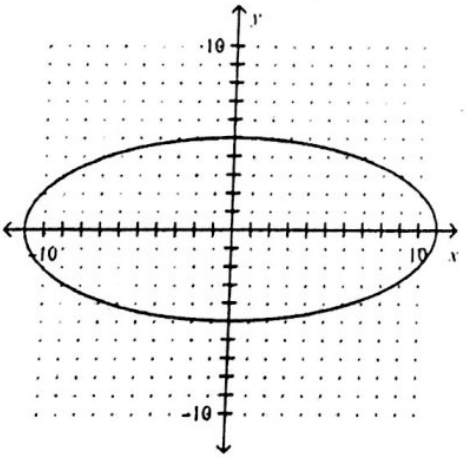


79. Which graph matches the equation $25x^2 + 36y^2 = 900$?

a.



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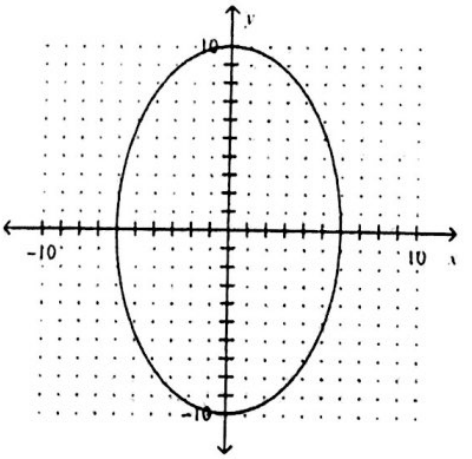

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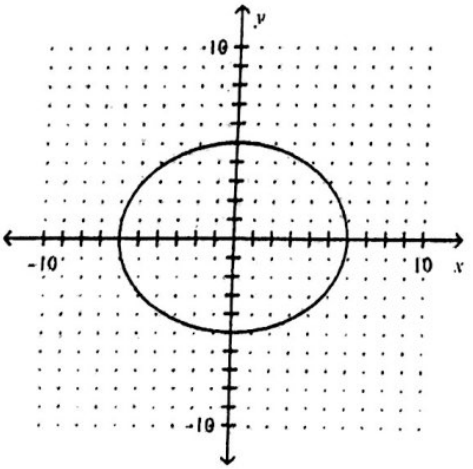

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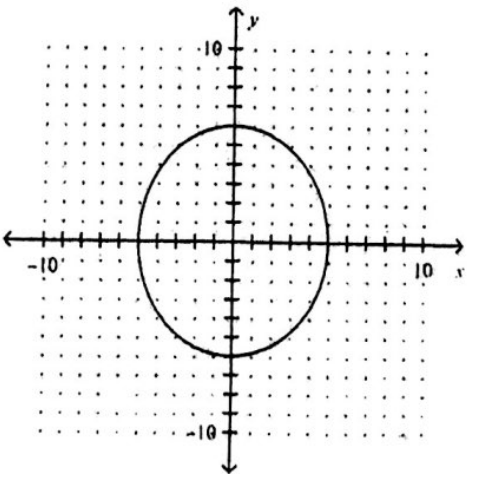

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