MATH 125/128

# FINAL EXAM

5/12

VERSION: 1

TEST NO._____

DO NOT WRITE ON THE TEST.

Exam

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

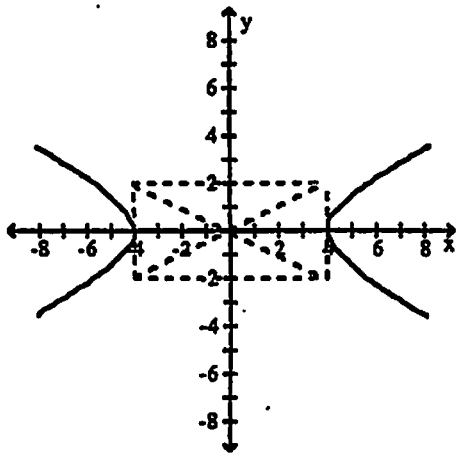
**Solve the system by the substitution method.**

1) $x^2 + y^2 = 85$
$x + y = -13$

A) {(6, 7), (7, 6)}
B) {(6, -7), (7, -6)}
C) {(-6, 7), (-7, 6)}
D) {(-6, -7), (-7, -6)}

**Find the standard form of the equation of the hyperbola.**

2)




A) $\frac{x2}{16} - \frac{y2}{4} = 1$
B) $\frac{x2}{4} - \frac{y2}{16} = 1$
C) $\frac{y2}{4} - \frac{x2}{16} = 1$
D) $\frac{y2}{16} - \frac{x2}{4} = 1$

**Use the binomial theorem to expand the expression.**

3) $(3x + 1)^5$

A) $243x^5 + 15x^4 + 90x^3 + 90x^2 + 15x + 1$
B) $243x^5 + 405x^4 + 270x^3 + 90x^2 + 15x + 1$
C) $(9x^2 + 6x + 1)^5$
D) $243x^5 + 81x^4 + 27x^3 + 9x^2 + 3x + 1$

**Find the center and radius of the circle.**

4) $x^2 + y^2 + 4x - 12y + 31 = 0$

A) (2, -6); r = 9
B) (-6, 2); r = 9
C) (6, -2); r = 3
D) (-2, 6); r = 3

**Given f(x) and g(x), find the indicated composition.**

5) $f(x) = x2 + 7$; $g(x) = \sqrt{x + 8}$
Find $(f \circ g)(x)$.

A) $(f \circ g)(x) = x2 + 16x + 71$
B) $(f \circ g)(x) = \sqrt{x2 + 15}$
C) $(f \circ g)(x) = x + 15$
D) $(f \circ g)(x) = x2 + 15$

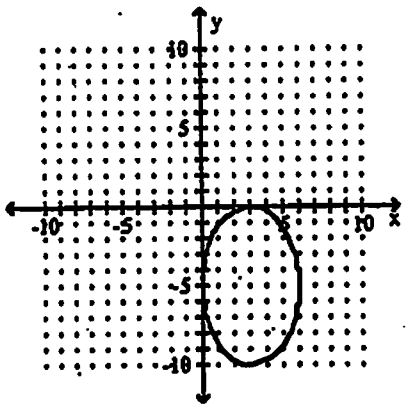
**Rewrite as an equivalent exponential equation. Do not solve.**

6) $\log_4 \frac{1}{64} = -3$

A) $(\frac{1}{64})^3 = 4$ B) $4^{64} = 3$ C) $4^{-3} = \frac{1}{64}$ D) $3^4 = \frac{1}{64}$

**Choose the equation that matches the graph.**

7)




A) $\frac{(y+5)^2}{25} - \frac{(x-3)^2}{9} = 1$ B) $\frac{(x-3)^2}{9} - \frac{(y+5)^2}{25} = 1$

C) $\frac{(x-3)^2}{25} + \frac{(y+5)^2}{9} = 1$ D) $\frac{(x-3)^2}{9} + \frac{(y+5)^2}{25} = 1$

**Determine whether the function is one-to-one. If so, find a formula for the inverse.**

8) $h(x) = x^3 + 5$

A) $h^{-1}(x) = \sqrt[3]{x-5}$ B) $h^{-1}(x) = \sqrt[3]{x} - 5$

C) $h^{-1}(x) = \sqrt[3]{x+5}$ D) Not a one-to-one function

**Simplify.**

9) $\log_2 \frac{1}{2}$

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

**Solve.**

10) $5 + 6e^{2x} = 11$

A) 1 B) $\frac{1}{2}$ C) 0 D) No solution

Solve the problem.

11) After t years, the number of grams of certain radioactive substance remaining is given by the formula:

$$N(t) = 20\left(\frac{1}{2}\right)^{t/24}$$

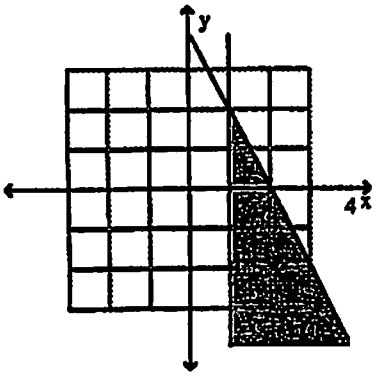
How many grams of the substance will remain after 72 years?
Round to the nearest hundredth of a gram.

A) 0.63 g B) 0.31 g C) 2.5 g D) 1.25 g

Graph the system of inequalities.

12) $2x + y \geq 4$
$x - 1 \geq 0$

A)

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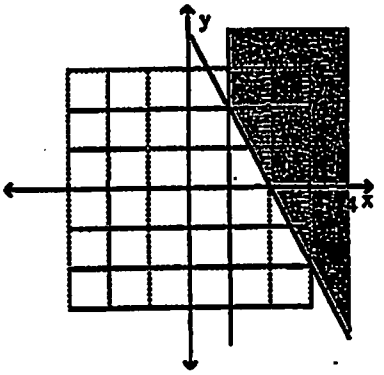


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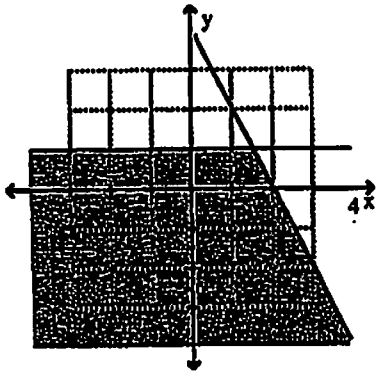
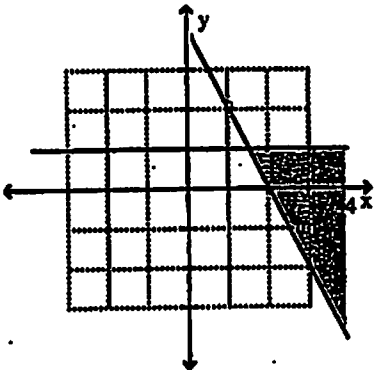



D)




Solve.

13) $\log_2(\sqrt{x2 - 9}) = 1$

A) $\pm\sqrt{11}$ B) $\pm\sqrt{13}$ C) -1, 5 D) No solution

14) $\log_6(x + 1) + \log_6(x + 3) = \log_6 8$

A) 5 B) -5, 1 C) i D) No solution

Solve.

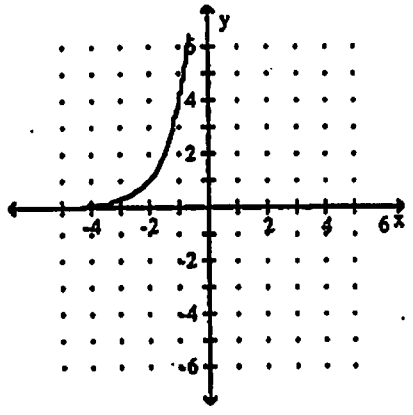
15) A projectile is thrown upward so that its distance, in feet, above the ground after t seconds is $h = -14t^2 + 336t$. What is its maximum height?

A) 5760 ft B) 4508 ft C) 2016 ft D) 85,344 ft

Graph.

16) $y = 4^x + 2$

A)



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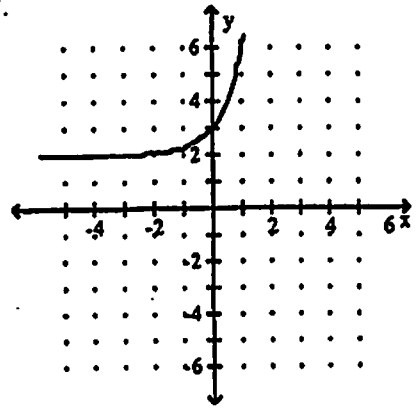

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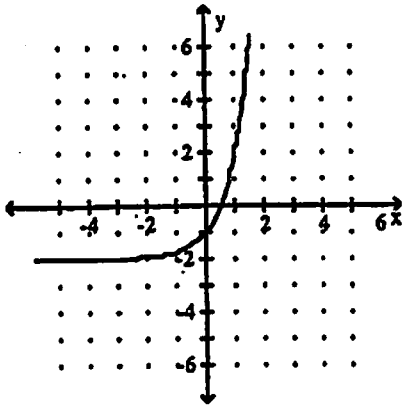
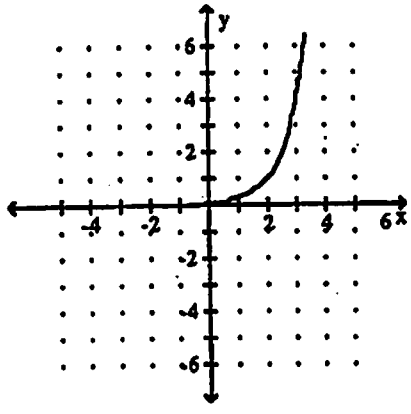


D)



**Solve. Provide answers in interval notation.**

17) $\frac{(x-3)(x+7)}{x-4} \leq 0$

A) $[-7, 3] \cup (4, \infty)$
B) $[3, 4)$
C) $(-\infty, -7] \cup [3, 4)$
D) $(-\infty, -7) \cup (3, 4)$

18) $s^2 + 5s - 6 < 0$

A) $(-\infty, -1)$
B) $(-1, 6)$
C) $(-\infty, -1) \cup (6, \infty)$
D) $(6, \infty)$

**Complete the square to write the function in the form $f(x) = a(x - h)^2 + k$.**

19) $f(x) = 6x^2 - 12x + 9$

A) $f(x) = 6(x - 1)^2 - 3$
B) $f(x) = 6(x - 3)^2 + 1$
C) $f(x) = 6(x - (-1))^2 + 3$
D) $f(x) = 6(x - 1)^2 + 3$

**Solve.**

20) $\sqrt{2x+3} - \sqrt{x+1} = 1$

A) $-3, -1$
B) No solution
C) 3
D) $3, -1$

**Find the x- and y-intercepts. If no x-intercepts exist, state so.**

21) $f(x) = -x^2 + 19x - 90$

A) x-intercepts (9, 0) and (10, 0); y-intercept (0,-90)
B) No x-intercepts; y-intercept (0,9)
C) x-intercepts (9, 0) and (10, 0); y-intercept (0,9)
D) x-intercepts (-9, 0) and (-10, 0); y-intercept (0,-90)

**Find an equation of the line satisfying the conditions. Write the equation in slope-intercept form.**

22) Through (-5, -2); perpendicular to $-5x - 2y = 27$

A) $y = -\frac{2}{5}x - 4$
B) $y = \frac{2}{5}x$
C) $y = \frac{5}{2}x + \frac{21}{2}$
D) $y = -\frac{5}{2}x - \frac{29}{2}$

**Simplify.**

23) $\sqrt{75k^7q^8}$

A) $(5k^3q^4)\sqrt{3k}$
B) $(5k^7q^8)\sqrt{3k}$
C) $(5q^4)\sqrt{3k^7}$
D) $(5k^3q^4)\sqrt{3}$

**Perform the indicated operation and simplify. Write the answer in the form a + bi.**

24) $\frac{8+9i}{9-3i}$

A) $\frac{11}{8} - \frac{7}{72}i$
B) $\frac{1}{24}$
C) $\frac{33}{2} - \frac{19}{2}i$
D) $\frac{1}{2} + \frac{7}{6}i$

**Solve.**

25) The distance D that a spring is stretched by a hanging object varies directly as the mass M of the object. If a 11-kg object stretches a spring 95 cm, find the distance the spring is stretched when the mass is 7-kg. Round to the nearest hundredth of a centimeter if necessary.

A) 8.64 cm
B) 0.81 cm
C) 60.45 cm
D) 113 cm

**Find the domain of the logarithmic function. Write your answer in interval notation.**

26) $f(x) = \log(x - 3)$

A) $(-\infty, 0) \cup (0, \infty)$
B) $(-\infty, 3) \cup (3, \infty)$
C) $(-3, \infty)$
D) $(3, \infty)$

**Perform the indicated operation and simplify.**

27) $\frac{x}{x^2 - 16} - \frac{7}{x^2 + 5x + 4}$

A) $\frac{x^2 + 6x + 28}{(x - 4)(x + 4)(x + 1)}$
B) $\frac{x^2 - 6x + 28}{(x - 4)(x + 4)}$
C) $\frac{x^2 - 6x + 28}{(x - 4)(x + 4)(x + 1)}$
D) $\frac{x^2 - 6}{(x - 4)(x + 4)(x + 1)}$

**Simplify.**

28) $\dfrac{m^2 - 9m}{9 - m}$

A) $-m$ B) $m$ C) $m + 3$ D) $-(m + 3)$

**Determine the domain of the rational function.**

29) $f(x) = \dfrac{x^2 - 36}{(x + 8)(x - 5)}$

A) $\{x \mid x \neq -8, x \neq 5\}$ B) $\{x \mid x \neq -6, x \neq 6\}$
C) $\{x \mid x \neq 0\}$ D) $\{x \mid x \neq -8, x \neq -5\}$

**Solve the system. If there is no solution or if the system's equations are dependent, so state.**

30) $\begin{cases} x - y + 5z = -1 \\ 5x + z = 0 \\ x + 3y + z = 3 \end{cases}$

A) $\{(0, 0, 1)\}$
B) no solution or $\emptyset$
C) $\{(0, 1, 0)\}$
D) infinitely many solutions; dependent equations

**Solve.**

31) $|x - 4| - 2 \geq 7$

A) $(-5, 13)$ B) $[-5, 13]$

C) $(-\infty, -5] \cup [13, \infty)$ D) $[13, \infty)$

**Solve the mixture problem.**

32) How many liters of a 30% alcohol solution must be mixed with 60 liters of a 50% solution to get a 40% solution?

A) 12 liters B) 60 liters C) 6 liters D) 120 liters

**Solve.**

33) $3(x - 9) + 30x < -5(-7x - 3) - 3x$ Put your answer in interval notation.

A) $(-42, \infty)$ B $(-\infty, 42)$ C) $(-\infty, -42)$ D) $(42, \infty)$

**Find the domain of the function. Put your answer in set-builder notation.**

34) $f(x) = \sqrt{3x + 9}$

A $\{x \mid x \geq -3\}$ B) $\left\{x \,\middle|\, x \geq -\frac{1}{3}\right\}$ C) $\{x \mid x \geq 3\}$ D) $\{x \mid x \leq -3\}$

**Solve the problem.**

35) An auto repair shop charged a customer $348 to repair a car. The bill listed $68 for parts and the remainder for labor. If the cost of labor is $40 per hour, how many hours of labor did it take to repair the car?

A) 7.5 hr B) 7 hr C) 6 hr D) 8 hr

**Divide.**

36) $\frac{x2 + 8x + 9}{x + 6}$

A) $x + 2 - \frac{3}{x+6}$ B) $\frac{x+2}{x+6}$ C) $x + 2 + \frac{3}{x+6}$ D) $x + 3$

**Simplify the expression so that no negative exponents appear in the final result. Assume all variables represent nonzero numbers.**

37) $\frac{4r^3(r4)^3}{15(r^3)^{-2}}$

A) $\frac{4}{15r^9}$ B) $\frac{4r^9}{15}$ C) $\frac{4r21}{15}$ D) $\frac{4}{15r^{21}}$

**Solve the problem.**

38) The length of a rectangular room is 5 feet longer than twice the width. If the room's perimeter is 178 feet, what are the room's dimensions?

A) Width = 42 ft; length = 47 ft B) Width = 33 ft; length = 71 ft
C) Width = 28 ft; length = 61 ft D) Width = 56 ft; length = 122 ft

**Write the point-slope form of the line satisfying the conditions. Then use the point-slope form of the equation to write the slope-intercept form of the equation in function notation.**

39) Slope = $\frac{2}{7}$, passing through (0, 2)

A) $f(x) = \frac{2}{7}x + 2$ B) $f(x) = \frac{7}{2}x + 7$

C) $f(x) = -\frac{2}{7}x - 2$ D) $f(x) = \frac{2}{7}x - 2$

**Rewrite the expression with a positive rational exponent. Simplify, if possible.**

40) $25^{-3/2}$

A) $-\frac{125}{2}$ B) $-\frac{1}{125}$ C) $\frac{1}{25}$ D) $\frac{1}{125}$