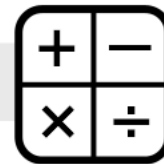


Released Form

Student Name: _____

Spring 2013
North Carolina
Measures of Student Learning:
NC's Common Exams
**Algebra II/
Integrated Math III**





1 Which equation is equivalent to $3 \log x + \log 2 = \log 3x - \log 2$?

A $\log x^3 + 2 = \log (3x - 2)$

B $\log (3x + 2) = \log (3x - 2)$

C $\log 6x = \log \left(\frac{3x}{2}\right)$

D $\log (2x^3) = \log \left(\frac{3x}{2}\right)$

2 Simplify: $\frac{(3 + 6i)^2}{2i}$

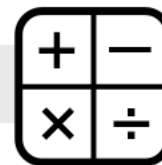
A $\frac{27i}{2}$

B $9 + 18i$

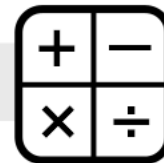
C $18 + 27i$

D $\frac{36 + 27i}{2}$

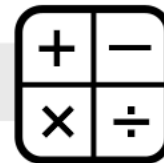
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- 3 Which polynomial function has zeros at 3, -4 , and 6?
- A $P(x) = x^3 - 6x^2 - 12x + 72$
- B $P(x) = x^3 - 5x^2 - 18x + 72$
- C $P(x) = x^3 + 5x^2 - 18x - 72$
- D $P(x) = x^3 + 7x^2 - 6x - 72$
- 4 Simplify: $\frac{4 - \sqrt{3}}{2 - \sqrt{3}}$
- A 2
- B $5 + 2\sqrt{3}$
- C $11 - 6\sqrt{3}$
- D $-11 + 6\sqrt{3}$
- 5 The pressure, P , measured in pounds per square inch (psi), on an object under water varies directly with its depth, d , measured in feet. If the pressure on an object at a depth of 20 feet is 8.6 psi, what is the pressure on an object at a depth of 25 feet?
- A 6.88 psi
- B 9.85 psi
- C 10.75 psi



- 6 If $f(x) = \frac{4}{3}x - 9$, what is $f^{-1}(-3)$?
- A -13
- B -9.5
- C -7
- D 4.5
- 7 The height, h (in feet), of a ball t seconds after it is thrown upward is given by the equation $h = -16t^2 + 60t + 5$. What does the constant term 5 in the equation represent?
- A time required for the ball to hit the ground
- B time required for the ball to reach the highest point
- C height after 5 seconds
- D height when first thrown
- 8 Which sentence describes the transformation of the graph of $f(x) = 2x^2$ to the graph of $g(x) = \frac{1}{2}x^2$?
- A The graph becomes wider.
- B The graph becomes narrower.
- C The graph shifts down.

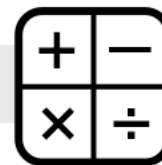


- 9 The table below shows the average weights for men 20–24 years of age.

Height (in inches)	Weight (in pounds)
62	130
64	138
66	148
68	156
70	167
72	176
74	186
76	197

If x represents height, and y represents weight, which linear equation best models these data?

- A $y = 5.01x - 181$
B $y = 4.79x - 168$
C $y = 0.21x + 35.2$
D $y = 0.17x + 40.2$



10 The table below represents the size, in acres, of the average farm.

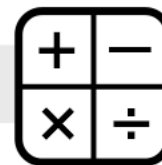
Year	1950	1960	1970	1980	1997	1998
Size of Farm (acres)	213	297	374	426	436	435

- Choose which mathematical model below best fits the data.
- Using the model, predict the approximate size of the average farm in the year 2010.

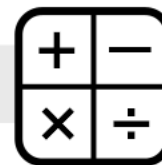
- A linear; 650 acres
B linear; 510 acres
C quadratic; 400 acres
D quadratic; 360 acres

11 What are the zeros of $y = \frac{x^2 - 2x - 3}{x^2 + 5x - 14}$?

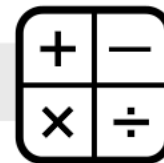
- A 3 and -1
B 1 and -3
C 7 and -2
D 2 and -7



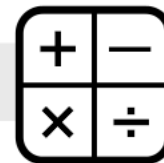
- 12 An airplane travels 1,400 miles in the same amount of time it takes a car to travel 210 miles. The car travels at a speed of 340 mph less than the airplane. What is the speed of the airplane?
- A 390 mph
B 400 mph
C 405 mph
D 410 mph
- 13 What translations should be applied to the graph of $y = \frac{4}{x}$ to produce the graph of $y = \frac{4}{x - 5} + 3$?
- A a shift 5 units to the right, and then a shift 3 units down
B a shift 5 units to the right, and then a shift 3 units up
C a shift 5 units to the left, and then a shift 3 units up
D a shift 5 units to the left, and then a shift 3 units down



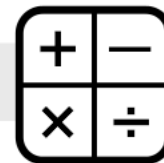
- 14 What are the horizontal and vertical asymptotes of $f(x) = \frac{x^2 + 2x + 1}{x^2 + 3x - 4}$?
- A $x = 1$ and $y = -1$
- B $x = -4$, $y = -1$, and $y = 1$
- C $x = \pm 1$ and $y = 0$
- D $x = -4$, $x = 1$, and $y = 1$
- 15 What are the vertical asymptotes of $y = \frac{2x^2 - x - 1}{6x^2 - x - 1}$?
- A $x = -1$, $x = \frac{1}{2}$
- B $x = -\frac{1}{2}$, $x = 1$
- C $x = -\frac{1}{2}$, $x = \frac{1}{3}$
- D $x = -\frac{1}{3}$, $x = \frac{1}{2}$
- 16 Approximately what is the smallest real zero of $f(x) = x^3 - 5x^2 + 2x + 6$?
- A -4.18
- B -1.68
- C -0.86



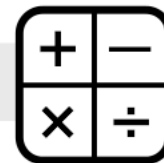
- 17 Zach purchased a stock. The value of the stock has been falling and rising as described by the polynomial function $V(x) = 2x^3 - 90x + 350$, where x is the number of weeks since the stock was purchased. What does the y -intercept of this function represent?
- A the number of weeks since the stock was purchased
 - B the value of the stock at its maximum
 - C the value of the stock when it was initially purchased
 - D the week at which the value was at its maximum
- 18 What is the domain of $f(x) = \sqrt{-x + 2}$?
- A $\{x : x \geq -2\}$
 - B $\{x : x \leq 2\}$
 - C $\{x : -2 < x < 2\}$
 - D $\{x : 0 < x < 2\}$
- 19 In which direction does the graph of $y = \sqrt{x + a}$ shift as the value of a decreases?
- A upward
 - B downward
 - C to the right
 - D to the left



- 20 Where does the minimum value of the function $y = |x - 5| - 4$ occur?
- A at $y = -5$
 - B at $y = 4$
 - C at $x = 0$
 - D at $x = 5$
- 21 Where is the vertex of $y = |x + 2|$?
- A on the negative x -axis
 - B on the positive x -axis
 - C on the negative y -axis
 - D on the positive y -axis
- 22 A city built an archway that can be modeled by the parabola $y = -x^2 + 8x + 20$. What are the coordinates of its vertex?
- A $(-4, 36)$
 - B $(-2, 10)$
 - C $(4, 36)$
 - D $(2, 10)$



- 23 The graph of $y = ax^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?
- A $y = a(x - 5)^2 + 3$
- B $y = a(x + 5)^2 + 3$
- C $y = a(x - 3)^2 + 5$
- D $y = a(x + 3)^2 + 5$
- 24 Which equation describes a parabola that has vertex $(-3, 1)$ and passes through point $(0, 4)$?
- A $y = \frac{1}{3}(x + 3)^2 + 1$
- B $y = 3(x + 3)^2 + 1$
- C $y = \frac{1}{3}(x - 3)^2 + 1$
- D $y = 3(x - 3)^2 + 1$



- 25 Over a 10-year period, two colleges raised their per-course tuitions (T_1 and T_2) each year. The tuitions can be modeled by the following equations:

College 1: $T_1 = 500(1.048)^x$

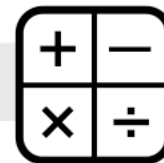
College 2: $T_2 = 446(1.068)^x$

In these equations, the tuitions are in dollars, and x represents elapsed time in years ($x = 0$ is the beginning of the 10-year period). Based on the model, at approximately what time during the 10-year period were the two tuitions equal?

- A $x = 5$ years
- B $x = 6$ years
- C $x = 7$ years
- D $x = 8$ years

This is the end of the multiple-choice portion of the test.

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The questions you read next will require you to answer in writing.

1. Write your answers on separate paper.
2. Be sure to write your name on each page.

1 The table below shows the height of a rocket at different times.

Time (seconds)	0	0.5	1.5	2.5	3.5
Height (feet)	0	28	60	60	28

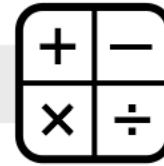
- Write a function that gives the height of the rocket, y , after x seconds.
- At what time does the rocket begin its descent?
- What is the rocket's total flight time?

2 The function $V(t) = 1,000(1.06)^{2t}$ models the value of an investment after t years.

- What was the initial value of the investment?
- As a percent, what interest rate is the investment earning each year?

3 A manager ordered 300 flowers. She paid \$1.35 per tulip, \$4.75 per orchid, and \$2.60 per rose for a total bill of \$766.60. She ordered 14 more roses than orchids.

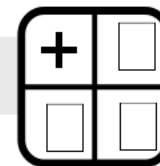
- Write a system of equations that models the situation. Define the



This is the end of the Algebra II/Integrated Math III test.

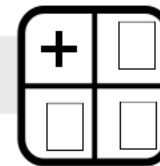
1. Look back over your answers.
2. Put all of your papers inside your test book and close the test book.
3. Place your calculator on top of the test book.
4. Stay quietly in your seat until your teacher tells you that testing is finished.

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Algebra II / Integrated Math III
RELEASED Form
Spring 2013
Answer Key

Item number	Type	Key	Competency Goal
1	MC	D	1 — Number and Operations
2	MC	D	1 — Number and Operations
3	MC	B	1 — Number and Operations
4	MC	B	1 — Number and Operations
5	MC	C	1 — Number and Operations
6	MC	D	2 — Relations and Functions
7	MC	D	2 — Relations and Functions
8	MC	A	2 — Relations and Functions
9	MC	B	2 — Relations and Functions
10	MC	C	2 — Relations and Functions
11	MC	A	2 — Relations and Functions
12	MC	B	2 — Relations and Functions
13	MC	B	2 — Relations and Functions
14	MC	D	2 — Relations and Functions
15	MC	D	2 — Relations and Functions
16	MC	C	2 — Relations and Functions
17	MC	C	2 — Relations and Functions
18	MC	B	2 — Relations and Functions



Item number	Type	Key	Competency Goal
24	MC	A	2 — Relations and Functions
25	MC	B	2 — Relations and Functions
26	CR	Rubric	2 — Relations and Functions
27	CR	Rubric	2 — Relations and Functions
28	CR	Rubric	2 — Relations and Functions

□

Item Types:

MC = multiple choice

CR = constructed response

□

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