Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 16-20,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.

2. All variables and expressions used represent real numbers unless otherwise indicated.

3. Figures provided in this test are drawn to scale unless otherwise indicated.

4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
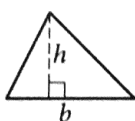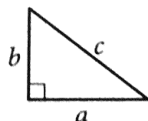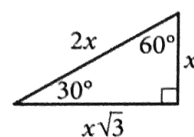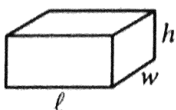
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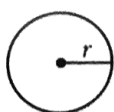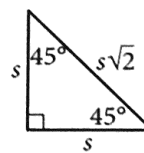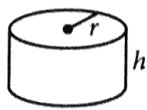
$A = \pi r^2$
$C = 2\pi r$
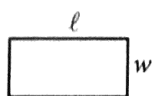
$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

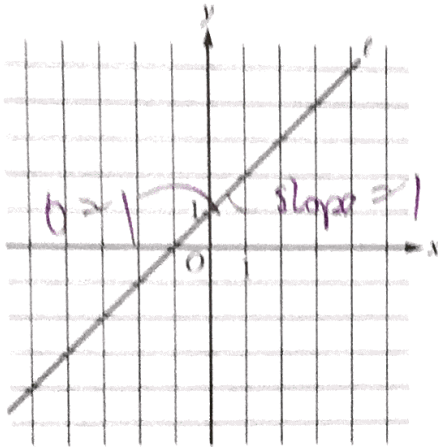$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

1

$0 > 1$ $slope = 1$

Which of the following is an equation of line ℓ in the xy-plane above?

A) $x = 1$

B) $y = 1$

C) $y = x$

D) $y = x + 1$

2
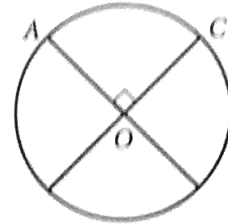
The circle above with center O has a circumference of 36. What is the length of minor arc $\overarc{AC}$?

A) 9

B) 12

C) 18

D) 36

$\frac{1}{4} \cdot 36 = 9$

3

What are the solutions of the quadratic equation $4x^2 - 8x - 12 = 0$?

A) $x = -1$ and $x = -3$

B) $x = -1$ and $x = 3$

C) $x = 1$ and $x = -3$

D) $x = 1$ and $x = 3$

$x^2 - 2x - 3 > 0$

$(x-3)(x+1) = 0$

CONTINUE →

4

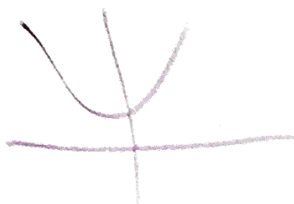Which of the following is an example of a function whose graph in the xy-plane has no x-intercepts?

A) A linear function whose rate of change is not zero

B) A quadratic function with real zeros

C) A quadratic function with no real zeros

D) A cubic polynomial with at least one real zero

5

$$\sqrt{k+2} - x = 0$$

In the equation above, k is a constant. If $x = 9$, what is the value of k?

A) 1

B) 7

C) 16

D) 79

$$\sqrt{k+2} = 9$$

$$k+2 = 81$$

6

Which of the following is equivalent to the sum of the expressions $a^2 - 1$ and $a + 1$?

A) $a^2 + a$

B) $a^3 - 1$

C) $2a^2$

D) a^3

lol

7

Jackie has two summer jobs. She works as a tutor, which pays $12 per hour, and she works as a lifeguard, which pays $9.50 per hour. She can work no more than 20 hours per week, but she wants to earn at least $220 per week. Which of the following systems of inequalities represents this situation in terms of x and y, where x is the number of hours she tutors and y is the number of hours she works as a lifeguard?

A) $12x + 9.5y \leq 220$
   $x + y \geq 20$

B) $12x + 9.5y \leq 220$
   $x + y \leq 20$

C) $12x + 9.5y \geq 220$
   $x + y \leq 20$

D) $12x + 9.5y \geq 220$
   $x + y \geq 20$

CONTINUE

8

In air, the speed of sound S, in meters per second, is a linear function of the air temperature T, in degrees Celsius, and is given by $S(T) = 0.6T + 331.4$. Which of the following statements is the best interpretation of the number 331.4 in this context?

A) The speed of sound, in meters per second, at 0°C

B) The speed of sound, in meters per second, at 0.6°C

C) The increase in the speed of sound, in meters per second, that corresponds to an increase of 1°C

D) The increase in the speed of sound, in meters per second, that corresponds to an increase of 0.6°C

9

$$y = x^2$$
$$2y + 6 = 2(x + 3)$$

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A) 1

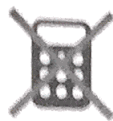B) 2

C) 3

D) 9

$2x^2 + 6 = 2x + 6$

$x = 1$

$y = 1$

10

If $a^2 + b^2 = z$ and $ab = y$, which of the following is equivalent to $4z + 8y$?

A) $(a + 2b)^2$

B) $(2a + 2b)^2$

C) $(4a + 4b)^2$

D) $(4a + 8b)^2$

$4(a^2 + b^2) + 8(ab)$

$= (2a + 2b)^2$

CONTINUE

11

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A) 11

B) 22

C) 44

D) 66

$$V = \pi r^2 h = 22$$

$$V^1 = 4 \cdot \tfrac{1}{2} V = 44$$

12

Which of the following is equivalent to $9^{\frac{3}{4}}$?

A) $\sqrt[4]{9}$

B) $\sqrt[4]{9}$

C) $\sqrt{3}$

D) $3\sqrt{3}$

$$9^{\frac{3}{4}} = \left(9^{\frac{1}{2}}\right)^{\frac{3}{2}}$$

$$= 3^{3/2}$$

$$= 3\sqrt{3}$$

13

At a restaurant, n cups of tea are made by adding t tea bags to hot water. If $t = n + 2$, how many additional tea bags are needed to make each additional cup of tea?

A) None

B) One

C) Two

D) Three

$$slope = 1$$

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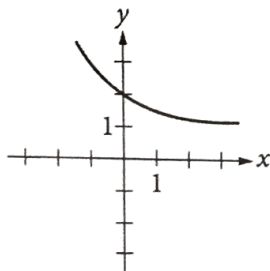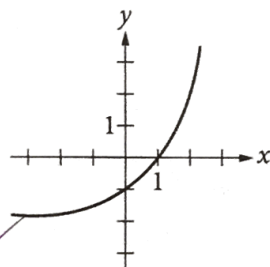
42

CONTINUE

14

$$f(x) = 2^x + 1$$

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy-plane?

A)
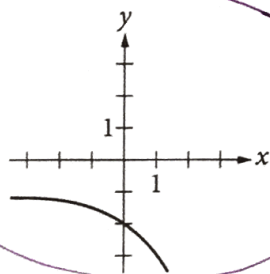

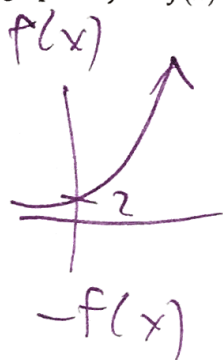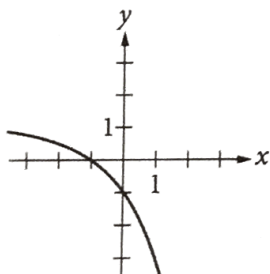B)

C)

D)

(handwritten: $f(x)$, 2, $-f(x)$, -2)

15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, m, he should drive each week?

A) $\dfrac{25}{4} m = 95$

B) $\dfrac{25}{4} m = 5$

C) $\dfrac{4}{25} m = 95$

D) $\dfrac{4}{25} m = 5$

(handwritten: $m \cdot \dfrac{1\,gal}{25\,mil} \cdot \dfrac{\$4}{gal} = \$5$)

CONTINUE →

16

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

$$10 + 60 \cdot h \leq 280$$
$$h \leq \frac{270}{60}$$
$$\boxed{4 \text{ hours}}$$

17

$$2(p + 1) + 8(p - 1) = 5p$$

What value of p is the solution of the equation above?

$$2p + 2 + 8p - 8 = 5p$$
$$5p = 6$$
$$\boxed{p = \frac{6}{5}}$$

18

$$\frac{1}{2}(2x + y) = \frac{21}{2}$$
$$y = 2x$$

The system of equations above has solution (x, y). What is the value of x?

$$\frac{1}{2}(2x + 2x) = \frac{21}{2}$$
$$2x = \frac{21}{2}$$
$$\boxed{x = \frac{21}{4}}$$

CONTINUE →

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

The expression above is equivalent to $\dfrac{a}{(x+2)^2}$, where a is a positive constant and $x \neq -2$.
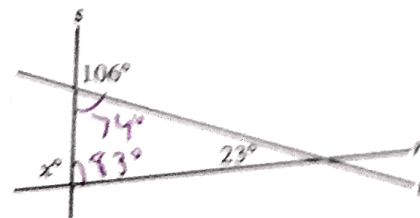
What is the value of a ?

$$\frac{2x+6}{(x+2)^2} - \frac{2(x+2)}{(x+2)^2}$$

$$= \frac{a}{(x+2)^2}$$

$$\implies \frac{2}{(x+2)^2} = \frac{a}{(x+2)^2}$$

$$\boxed{a = 2}$$

Intersecting lines r, s, and t are shown below.

What is the value of x ?

$$180 - 83° = \boxed{97°}$$

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.