

Spring 2013  
North Carolina  
Measures of Student Learning:  
NC's Common Exams  
**Precalculus**



Public Schools of North Carolina  
State Board of Education  
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- 1 What are the **approximate** rectangular coordinates for the point with polar coordinates  $(5, 30^\circ)$ ?
- A  $(2.5, 2.89)$
- B  $(2.5, 4.33)$
- C  $(2.89, 4.33)$
- D  $(4.33, 2.5)$
- 3 A quadratic function,  $f$ , has zeros  $P$  and  $Q$ , such that  $P + Q = 5$  and  $\frac{1}{P} + \frac{1}{Q} = 8$ . Which choice describes  $f$ ?
- A  $f(x) = 8x^2 - 40x + 5$
- B  $f(x) = 8x^2 - 40x - 5$
- C  $f(x) = 2x^2 - 10x + 5$
- D  $f(x) = 2x^2 - 10x - 5$

- 4 Lucy invested \$6,000 into an account that earns 6% interest compounded continuously. **Approximately** how long will it take for Lucy's investment to be valued at \$25,000?
- A 52.7 years  
B 46.9 years  
C 24.5 years  
D 23.8 years

- 5 A lamppost is located 418 feet from a building. The angle of elevation from the base of the lamppost to the top of the building is  $32.3^\circ$ . **Approximately** how tall is the building?
- A 223 feet  
B 264 feet  
C 510 feet  
D 661 feet

- 6 Two functions are shown below.

$$\begin{aligned}T(x) &= -x \\ P(x) &= 10x + 2\end{aligned}$$

What is the value of  $P(T(3)) - T(P(3))$ ?

- A 8  
B 4  
C 0  
D -4
- 7 A piecewise function is shown below.

$$f(x) = \begin{cases} cx + 1, & x \leq 2 \\ cx^2 - 1, & x > 2 \end{cases}$$

For what value of  $c$  does  $\lim_{x \rightarrow 2} f(x)$  exist?

- A -2  
B -1  
C 1  
D 4

8 What are the polar coordinates of  $(4, 9)$ ?

A  $(\sqrt{97}, 66^\circ)$

B  $(\sqrt{97}, 114^\circ)$

C  $(\sqrt{13}, 66^\circ)$

D  $(\sqrt{13}, 114^\circ)$

13 What is the distance between  $y$ -intercepts of the graph of  $x + 8 = 2(y + 3)^2$ ?

A 4

B 6

C 11

D 15

14 Which is a solution set to  $x + \frac{3x}{x-1} = \frac{x+2}{x-1}$ ?

A  $\{-1\}$

B  $\{-2\}$

C  $\{-2, 1\}$

D  $\{2, -1\}$

15 What is the range of the inverse of  $y = \tan x$ ?

A  $-\frac{\pi}{2} < y < \frac{\pi}{2}$

B  $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

C  $0 < y < \pi$

D  $0 \leq y \leq \pi$

16 James is standing 10 meters away from Samantha.

- A bird is located in the sky at a point between where James and Samantha are standing.
- James is looking up at the bird at an angle of elevation of  $74^\circ$ .
- Samantha is looking up at the bird at an angle of elevation of  $47^\circ$ .

**Approximately** how far is the bird from Samantha?

- A 7.6 meters
- B 8.5 meters
- C 11.2 meters
- D 13.1 meters

17 What is the inverse function of  $f(x) = \log_5(2x - 1)$ ?

- A  $f^{-1}(x) = 5^x - 1$
- B  $f^{-1}(x) = \frac{5^x + 1}{2}$
- C  $f^{-1}(x) = \log_2(5x - 1)$
- D  $f^{-1}(x) = \log_5 \frac{5x + 1}{2}$

19 What type of conic section is represented by  $r = \frac{8}{16 + 125 \sin \theta}$ ?

- A circle
- B ellipse
- C hyperbola
- D parabola

21 Which expression is equivalent to  $(\sec \theta) \left( \frac{\sin \theta}{\tan \theta} \right)$ ?

- A  $\cos^2 \theta - \sin^2 \theta$
- B  $\sin^2 \theta - \cos^2 \theta$
- C  $\cot^2 \theta - \csc^2 \theta$
- D  $\csc^2 \theta - \cot^2 \theta$

22 Suppose that for each foot of land along the street, the annual tax is \$25 per foot. The diagram below shows a plot of land.



**About** how much is the annual tax for the plot?

- A \$1,238
- B \$1,293
- C \$1,321
- D \$1,411

23 The function  $C(x) = \frac{2.50x + 1.00}{x}$  models the cost per item for a company to produce  $x$  items after the first item is made. What is the inverse function of  $C(x)$ ?

- A  $C^{-1}(x) = \frac{1.00}{x - 2.50}$
- B  $C^{-1}(x) = \frac{x - 2.50}{1.00}$
- C  $C^{-1}(x) = \frac{x - 1.00}{2.50}$
- D  $C^{-1}(x) = \frac{2.50}{x - 1.00}$

- 24 A computer rental company charges \$50 to rent a computer for one week. The table below shows the daily late fees the company charges if a computer is returned late.

Days Late	Daily Late Fee
days 1 through 10	\$5
days 11 through 20	\$8
days 21 through 30	\$10

What would be the total cost of renting a computer for one week and returning it 15 days late?

- A \$120  
B \$125  
C \$140  
D \$170
- 25 From a point 100 feet from the base of a building, Angie looks up at a  $40^\circ$  angle to the top of a building. She walks 20 feet closer to the building. At *approximately* what angle must Angie now look up to see the top of the building?
- A  $32^\circ$   
B  $46^\circ$   
C  $60^\circ$   
D  $77^\circ$

## SOLUTIONS

- |      |      |       |       |       |       |
|------|------|-------|-------|-------|-------|
| 1. D | 5. B | 8. A  | 16. C | 21. D | 24. C |
| 3. A | 6. B | 14. B | 17. B | 22. A | 25. B |
| 4. D | 7. C | 15. A | 19. C | 23. A |       |