Precalculus
NC Final- Practice Problems
Test Grade

Name_____
Date_____

- Must have at minimum of 20 problems completed with accurate work in order credit. No credit will be given for solutions without work.
- If the calculator is used and no work is needed, write down the calculator prompts.
  ex. 1) enter equation in y=
  - 2) Press Graph, calc, then intersect.
  - 3) Conclusion: the x value in the result is the solution to the equation.
  -
- If you choose to complete additional problems, point of extra credit will be awarded as follows.

  1-point for Level 1 problems (I)
  2-point for Level 2 problems (II)
  3-point for Level 3 problems (III)

- You may choose from any of the following problems.

____1) I

What are the ***approximate*** rectangular coordinates for the point with polar coordinates (5, 30°)?

A (2.5, 2.89)

B (2.5, 4.33)

C (2.89, 4.33)

D (4.33, 2.5)

____2) III

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 $f(x) = 2x^2 - 10x - 5$

____3) I

A sequence is shown below.

6, 12, 20, 30, 42, 56, . . .

Which is the recursive formula for this sequence?

A $t_n = n + 2(t_{n-1} + 1)$

B $t_n = (t_{n-1} + 1)(n - 2)$

C $t_n = 2(t_{n-1} + 2) - (n + 2)$

D $t_n = t_{n-1} + 2(n + 1)$

____4) I

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) I

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°. ***Approximately*** how tall is the building?

A 223 feet

B 264 feet

C 510 feet

D 661 feet

____6) I

Two functions are shown below.

$$T(x) = {}^{-}x$$
$$P(x) = 10x + 2$$

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

A 8

B 4

C 0

D $^{-}4$

____7) III

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 $\lim_{x \to 2} f(x)$ exist?

A $^{-}2$

B $^{-}1$

C 1

D 4

____8) I

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

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

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

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

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

____9) I

A sequence is shown below.

$$1, 3, 3^2, 3^3, \ldots$$

How many terms of the sequence must be added together for the sum to equal 3,280?

A 6

B 7

C 8

D 9

____10) II

The first term of an infinite geometric sequence is 2. The sum of the sequence is 6. What is the common ratio of the sequence?

A $\frac{1}{3}$

B $\frac{2}{3}$

C $\frac{3}{3}$

D $\frac{4}{3}$

____11) II

Which is true of the series shown below?

$$\pi + \frac{3\pi}{4} + \frac{9\pi}{16} + \frac{27\pi}{64} + \ldots$$

A The series diverges.

B The series converges to $\frac{3\pi}{2}$.

C The series converges to $\frac{4\pi}{3}$.

D The series converges to 4π.

___12) II

Karen recursively generated a sequence of five positive integers by starting with a positive integer, a_1, and then applying the recursive formula $a_n = a_{n-1} + 3n - 1$ to generate a_n for n = 2, 3, 4, and 5.

If the value of a_5 was 407, what was the value of Karen's starting term, a_1?

A 366

B 367

C 368

D 369

___13) III

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) II

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) II

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°.
- Samantha is looking up at the bird at an angle of elevation of 47°.

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) III

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 $f^{-1}(x) = \log_5 \frac{5x + 1}{2}$

____18) III

What is the value of the limit shown below?

$$\lim_{n\to\infty}\left(\frac{3^n - 1}{3^n}\right)$$

A $\frac{1}{3}$

B $\frac{2}{3}$

C 1

D $+\infty$

____19) III

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

A circle

B ellipse

C hyperbola

D parabola

____20) III

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

A $\cos^2\theta - \sin^2\theta$

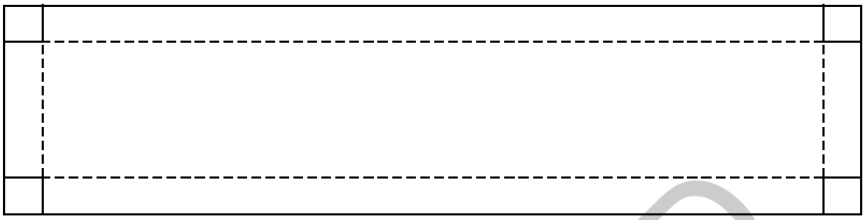
B $\sin^2\theta - \cos^2\theta$

C $\cot^2\theta - \csc^2\theta$

D $\csc^2\theta - \cot^2\theta$

____21) II

James had a rectangular piece of cardboard that was four times as long as it was wide. He wanted to use the cardboard to make a box with no lid. To do this, he first cut a 3-by-3-inch square out of each of the four corners of the piece of cardboard, as shown in the picture below.



Then James folded the cardboard along the four dotted lines shown in the picture. This created an open box with a volume of 336 cubic inches.

What was the width of the sheet of cardboard that James started with?

A 10.5 inches

B 9.5 inches

C 8.5 inches

D 7.5 inches

____22) III

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

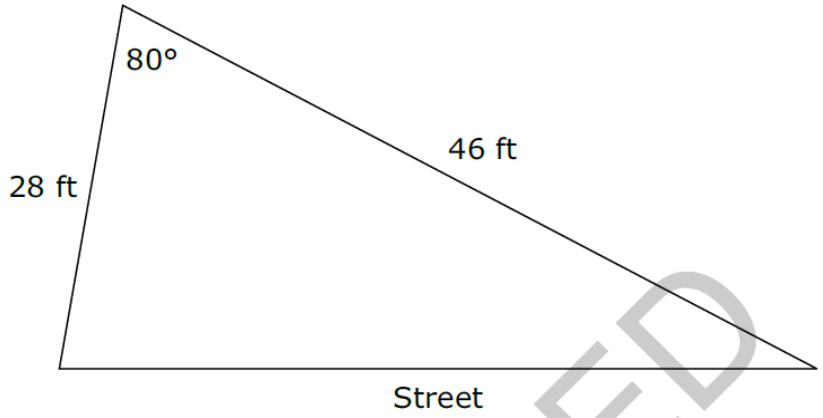
B $C^{-1}(x) = \frac{x - 2.50}{1.00}$

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

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

____23) I

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

____24) I

From a point 100 feet from the base of a building, Angie looks up at a 40° 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°

B 46°

C 60°

D 77°

____25) II

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

____26) III

Two parametric equations are shown below, where $t \geq 0$.

$$x = \frac{1}{3}\sqrt{t} + 3$$
$$y = 4t^2 - 7$$

Which nonparametric equation can be used to graph the curve described by the parametric equations?

A $y = \frac{4}{9}(x + 1) - 7$

B $y = \frac{4}{3}(x + 3) - 7$

C $y = 36(x - 1)^4 - 7$

D $y = 324(x - 3)^4 - 7$

____27) II

The formula for a sequence is shown below.

$$a_n = 2a_{n-1} + 3,\ a_1 = 3$$

Which is another formula that represents the sequence?

A $f(n) = 3(2^n - 1)$

B $f(n) = 2n^3 - 3n^2 + 8n + 3$

C $f(n) = 2(n^2 + 1)$

D $f(n) = 3n^2 + 8n - 1$

____28) II

When $a_1 = 25{,}000$, what is the sum of the infinite sequence defined by the equation $a_{n+1} = 0.8a_n$?

A 125,000

B 140,000

C 160,000

D 195,000

____29) III

What is the end behavior of the function $f(x) = \frac{100}{1 + 5(0.75)^x}$?

A $\lim_{x \to -\infty} f(x) = 0$ and $\lim_{x \to \infty} f(x) = \infty$

B $\lim_{x \to -\infty} f(x) = 0$ and $\lim_{x \to \infty} f(x) = 100$

C $\lim_{x \to -\infty} f(x) = 1$ and $\lim_{x \to \infty} f(x) = \infty$

D $\lim_{x \to -\infty} f(x) = 1$ and $\lim_{x \to \infty} f(x) = 100$

____30) III

In the piecewise function below, k is a constant.

$$f(x) = \begin{cases} \dfrac{x^2 - k^2}{x - k}, & x \neq k \\ 4 - k, & x = k \end{cases}$$

What is the value of the limit $\lim_{x \to k^-} f(x)$?

A ^-2k

B $2k$

C 0

D Limit does not exist.

____31) III

Which equation is the rectangular form of the polar equation $r = \dfrac{2}{1 + \cos\theta}$?

A $x^2 + 4y = 4$

B $x^2 + y^2 = 4$

C $y^2 + 4x = 4$

D $y^2 - 4x = 4$

____32) III

What are the polar coordinates of the point $(^-2\sqrt{3}, 2\sqrt{3})$, where $0 \leq \theta \leq 360$?

A $(2\sqrt{6}, 150°)$ and $(^-2\sqrt{6}, 210°)$

B $(2\sqrt{6}, 135°)$ and $(^-2\sqrt{6}, 315°)$

C $(2\sqrt{6}, 120°)$ and $(^-2\sqrt{6}, 240°)$

D $(2\sqrt{6}, 30°)$ and $(^-2\sqrt{6}, 330°)$

____33) II

Which equation could represent the graph of $y = f(x)$ when it is expanded horizontally by a factor of 3, then translated 2 units right?

a) $y = f\left(\frac{1}{3}(x+2)\right)$ b) $y = f(3(x-2))$ c) $y = f\left(\frac{1}{3}(x-2)\right)$

d) $y = f(3(x+2))$ e) $y = 3f(x-2)$

____34) I

Suppose the radian measure for an angle is $\theta = -6\pi/5$. What is the degree measure for this angle?

(a) $a = 150°$ (b) $a = -216°$

(c) $a = 36°$ (d) $a = -150°$

(e) $a = 216°$

____35) I

The slope of the line $3x - 4y + 8 = 0$ is

(a) $m = -4$ (b) $m = 3$

(c) $m = 3/4$ (d) $m = 4/3$

(e) $m = 8$

____36) I

Cole is standing on a level playing field when he throws a ball to Janice. The height H of the ball in feet above the ground s seconds after Cole throws it is given by the function

$$H = f(s) = 5.5 - 2(t-1)^2$$

The maximum height of the ball above the ground will be

(a) $H = 2$ feet (b) $H = 5.5$ feet

(c) $H = 3.5$ feet (d) $H = 7.5$ feet

(e) $H = 10$ feet

____37) II

Suppose that b is the radian or degree measure of an angle. As along as all factors are defined, which of the following expressions is equal to

$$\frac{\cot(b)\cos(b)}{\csc(b)}$$

(a) $\cos^2(b)$

(b) 1

(c) $\sin^2(b)$

(d) $\tan(b)$

(e) $\dfrac{\cos^3(b)}{\sin(b)}$

____38) I

Polly erects a vertical flagpole on a stretch of level ground. A forty-foot section of rope is attached to the top of the flagpole. When Polly pulls the rope tight so that the other end just touches the ground, she finds that the tight rope makes an elevation angle of $37.6°$ with the ground. To th nearest foot, how tall is the flagpole?

(a) 21 feet

(b) 31 feet

(c) 40 feet

(d) 32 feet

(e) 24 feet

____39) II

The salary of the vice president of the ShoeTunes corporation is given by $P(t) = 60000 \cdot (1.03)^t$, where P is measured in dollars, and t is the number of years since she was hired. Which of the following statements is true?

(a) She will be receiving a 103% raise each year.

(b) Her salary next year will be 3% of her salary this year.

(c) Her salary next year will increase by 3% compared to her salary this year.

(d) Her salary increases by $\$1,800$ every year.

(e) Her salary increases by $\$61,800$ every year.