Precalculus Final Exam Review

1) What are the **approximate** rectangular coordinates for the point with polar coordinates $(4, 60°)$?
   A) $(3.46, 2)$
   B) $(-3.81, -1.22)$
   C) $(2, 3.46)$
   D) $(-1.22, -3.81)$

2) A sequence is shown below.

   $$5, 7, 11, 17, 25, 35, \ldots$$

   Which is the recursive formula for this sequence?
   A) $t_n = n + 3(t_{n-1} + 2)$
   B) $t_n = (t_{n-1} + 1)(n - 4)$
   C) $t_n = 2(t_{n-1} + 2) - (n + 1)$
   D) $t_n = (t_{n-1} + 2(n - 1))$

3) A quadratic function, f, has a positive zero P and a minimum Q, such that the distance between P and Q is $\frac{5\sqrt{29}}{4}$. What is the equation for the quadratic function?
   A) $f(x) = -4x^2 + 2x - 3$
   B) $f(x) = x^2 + 3x - 4$
   C) $f(x) = 2x^2 + x - 4$
   D) $f(x) = x^2 + 3x - 3$

4) Janet is investing money into an account that earns continuously compounded interest. Determine the amount of time it will take Janet's principal amount of $4000 to double with a 5.5% interest rate.
   A) 10 years
   B) 12.6 years
   C) 14.3 years
   D) 15.1 years

5) A person is standing on top of a building that is 540 feet tall. They are looking down at a statue at an angle of depression of $60°$. **Approximately** how far away from the base of the building is the statue?
   A) 3458 feet
   B) 312 feet
   C) 84 feet
   D) 935 feet

6) Two functions are shown below.
$$f(x) = 2x^2$$
$$g(x) = -3x - 1$$
What is the value of $f(g(2)) + g(f(-1))$
A) 91
B) 56
C) 7
D) 14

7) A piecewise function is shown below. For what value of k does $\lim\limits_{x \to -2} f(x)$ exist?
$$f(x) = \begin{cases} x^2 - k & x \le -2 \\ x + 1 & x > -2 \end{cases}$$
A) 4
B) 2
C) 5
D) -5

8) What are the polar coordinates of $(2, 8)$ in radians?
A) $(8.246, 1.326)$
B) $(7.746, 1.158)$
C) $(8.246, 0.245)$
D) $(-0.291, 1.979)$

9) A sequence is shown below.
$$2, 6, 10, 14, 18, \ldots$$
How many terms of the sequence must be added together for the sum to equal 1,152?
A) 21
B) 22
C) 23
D) 24

10) The first term of an infinite arithmetic sequence is -6. The ninth term of the sequence is 68. What is the common difference of the sequence?
A) 8.2
B) 12
C) 9.25
D) 13.5

11) Which is true of the series shown below?

$$\frac{1}{2} - \frac{1}{4} + \frac{1}{8} - \frac{1}{16} + \cdots$$

A) The series diverges.
B) The series converges to 1
C) The series converges to 1/3
D) The series converges to 1/2

12) Kris recursively generated a sequence of five positive integers by starting with a positive integer, a_1, and then applying the recursive formula $a_n = a_{n-1} + 5n$ to generate a_n for n = 2, 3, 4, and 5. If the value of a_4 was 202, what was the value of Karen's starting term, a_1?
A) 167
B) 176
C) 125
D) 157

13) What is the distance between y-intercepts of the graph of $x = \frac{y^2-5}{2}$?
A) 3.041
B) 2.236
C) 4.472
D) 6.902

14) Which is a solution set to $\frac{x}{x-2} + \frac{1}{x-4} = \frac{2}{x^2-6x+8}$?
A) {-1}
B) {4}
C) {-1, 4}
D) No solution.

15) What is the range of y = 4sin x?
A) $-1 \le y \le 1$
B) $0 \le y \le 1$
C) $-4 \le y \le 4$
D) $-\infty \le y \le \infty$

16) Johnny is standing 15 feet away from George.
- A plane is located in the sky at some point between where Johnny and George are standing.
- Johnny is looking up at the plane at an angle of elevation of 63°
- George is looking up at the plane at an angle of elevation of 78°

Approximately how far is the bird from Johnny?

A) 0.98 ft

B) 8 ft

C) 23.3 ft

D) 24.5 ft

17) What is the inverse function of $f(x) = 4x^2 - 16$

A) $y = \frac{1}{4x^2-16}$

B) $y^2 = x + 16$

C) $y = \sqrt{0.25x + 4}$

D) $y = \pm\sqrt{\frac{1}{4}x + 4}$

18) What is the value of the limit shown below?

$$\lim_{x \to -\infty} \frac{x+2}{x}$$

A) $-\infty$

B) 1

C) 2

D) Does Not Exist

19) How many petals are on the polar rose which is represented by $r = 2sin4t$

A) 2

B) 4

C) 6

D) 8

20) Convert the parametric equation below to rectangular form.

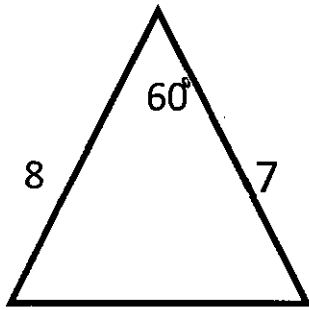$$x = 2t + 4$$
$$y = t^2 - 1$$

A) $f(x) = \frac{1}{4}x^2 - 2x + 3$

B) $f(x) = 4x^2 + 2x - 4$

C) $f(x) = \frac{1}{2}x^2 - 2x + 3$

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

21) Which expression is equivalent to $tanx sinx + cosx$?

A) $sinx cosx$

B) $secx$

C) $sin^2 x$

D) $\dfrac{1}{tanx}$

22) Suppose that for each inch of ribbon needed to line the bottom of a party hat, the cost is $0.21 per inch. Round to the nearest tenth of an inch. The diagram below shows the party hat. About how much will the ribbon cost?

A) $7.50

B) $1.58

C) $219.7

D) $46.14

23) The function $P(x) = 400x - 50$ represent the profit for a company after selling x items. What is the inverse function of $P(x)$?

A) $P^{-1}(x) = x + 50$

B) $P^{-1}(x) = \dfrac{x+50}{400}$

C) $P^{-1}(x) = -400x + 50$

D) $P^{-1}(x) = \dfrac{x-400}{50}$

24) Determine the type of conic section represented by the equation below and state the center.

$$\frac{(x-2)^2}{4} - \frac{(y+4)^2}{25}$$

A) Ellipse; (-2, 4)

B) Ellipse; (2, -4)

C) Hyperbola; (-2, 4)

D) Hyperbola; (2, -4)

25) A taxi driver charges a $4 pick-up fee plus a tiered rate per mile. The table below displays the taxis driver's mileage rates.

Miles	Rate Per Mile
Miles 0 through 25	$0.25
Miles 26 through 35	$0.20
Miles 36 through 50	$0.15
Miles 51 and up	$0.10

What would the cost be for a taxi ride that was 38 miles?
A. $12.70
B. $8.40
C. $6.50
D. $4.60

26) Revenue (in thousands) from sales of Compaq computers (a brand now extinct) are shown in the following table where t is the number of years since 1990.

t	0	1	5	10
$R(t)$	50	33.5	5.2	0.7

Which type of function best models the data and why?
A. A linear function, because the revenue is decreasing by 65% each year.
B. A linear function, because the revenue is decreasing by 35% each year.
C. An exponential function, because the revenue is decreasing by 65% each year.
D. An exponential function, because the revenue is decreasing by 35% each year.

27. A tennis ball is launched straight upward from ground level with an initial velocity of 75 feet per second. The height, h (in feet above ground level), of the tennis ball t seconds after the launch is given by the function $h(t) = -16t^2 + 75t$. At approximately what value of t will the object have a height of 63 feet and be traveling downward?
A. 2.34 seconds
B. 1.10 seconds
C. 3.59 seconds
D. 0.73 seconds

28. What is the range of the function $f(x) = 3 - |2x + 4|$?
A. $(-\infty, \infty)$
B. $(-\infty, 3]$
C. $[3, \infty)$
D. $(-\infty, 4]$

29. What transformations have occurred to create the function $f(x) = 2\sqrt{3x - 6}$ from the function $g(x) = \sqrt{x}$?

   A. The graph of the function has been stretched vertically, stretched horizontally, and shifted right 6.

   B. The graph of the function has been stretched vertically, shrunk horizontally, and shifted right 6.

   C. The graph of the function has been stretched vertically, stretched horizontally, and shifted right 2.

   D. The graph of the function has been stretched vertically, shrunk horizontally, and shifted right 2.

30. A radio station tower was built in two sections. From a point 87 feet from the base of the tower, the angle of elevation of the top of the first section is 25°, and the angle of elevation of the top of the second section is 40°. To the *nearest foot*, what is the height of the top section of the tower?

   A. 32 feet

   B. 86 feet

   C. 114 feet

   D. 41 feet

31. Consider the two trigonometric functions:

$f(x) = 4cos(\frac{1}{2}x)$

$g(x) = -4cos(\frac{1}{2}x + \frac{\pi}{3})$

How should the graph of $f(x)$ be changed to produce the graph of $g(x)$?

   A. Reflected over the y-axis and shifted left $\frac{\pi}{3}$

   B. Reflected over the x-axis and shifted left $\frac{\pi}{3}$

   C. Reflected over x-axis and shifted left $\frac{\pi}{6}$

   D. Reflected over x-axis and shifted left $\frac{2\pi}{3}$

32. Triangle ABC has the following properties:

   • The angle at vertex A is 17°and the angle at vertex B is obtuse

   • Side a is 5.8 units in length

   • Side b is 14.3 units in length

What is the approximate length of the side opposite vertex C?

   A. Not possible

   B. 17.7 units

   C. 9.6 units

   D. 15.7 units

33. What value of x satisfies the equation $2log_5(3x - 1) = 6$.

  A. 42

  B. 209

  C. 2592

  D. 81

34. What is the inverse function of $f(x) = log_7(\frac{x+3}{2})$?

  A. $f^{-1}(x) = 7^x - 3$

  B. $f^{-1}(x) = \frac{7^x - 3}{2}$

  C. $f^{-1}(x) = 2(7^x) - 3$

  D. $f^{-1}(x) = 2(7^x) + 3$

35. You need to make a pizza box. You know that the box needs to be two inches deep, and needs to have a volume of 144 cubic inches. You will be forming the box by cutting out a large rectangle, and then cutting out the two-inch squares from the corners that will allow you to fold up the edges to make a two-inch-deep box. The rectangle needs to have a length that is 1 more than its width. What should be the length of the large rectangle?

  A. 12 inches

  B. 13 inches

  C. 8 inches

  D. 9 inches

36. A plane flies due east at a rate of 150 mph. The wind is blowing south at a rate of 50 mph. What is the resultant velocity?

  A. 158 mph @ 72° S of E

  B. 158 mph @ 72° E of S

  C. 158 mph @ 18° E of S

  D. 158 mph @ 18° S of E

37. What are the polar coordinates of the point $(\frac{5}{2}, \frac{-5\sqrt{3}}{2})$ where $0 \le \theta \le 360$?

  A. $(5, 300°)$ and $(-5, 240°)$

  B. $(5, 300°)$ and $(-5, -240°)$

  C. $(5, 300°)$ and $(-5, -120°)$

  D. $(5, 60°)$ and $(5, -300°)$

38. Which equation is the rectangular form of the polar equation $r = \frac{4}{1 - cos\theta}$?

A. $x^2 + 8y = 16$
B. $x^2 + y^2 = 16$
C. $y^2 = 16$
D. $y^2 - 8x = 16$

39. What type of conic section is represented by $r = \frac{9}{6+10sin\theta}$?
   A. Circle
   B. Hyperbola
   C. Ellipse
   D. Parabola

40. When $a_1 = 13,000$, what is the sum of the infinite sequence defined by the equation $a_{n+1} = 0.75a_n$?
   A. 52000
   B. 17333
   C. 48000
   D. 51000

41. The first term of an infinite geometric sequence is 9. The sum of the sequence is 45. What is the common ratio of the sequence?
   A. $\frac{1}{5}$
   B. $\frac{2}{3}$
   C. $\frac{4}{5}$
   D. 5

42. What is the end behavior of the function $f(x) = \frac{50}{1+10(.60)^x} + 4$?
   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 $\lim_{x \to \infty} f(x) = 54$
   C. $\lim_{x \to -\infty} f(x) = 4$ and $\lim_{x \to \infty} f(x) = \infty$
   D. $\lim_{x \to -\infty} f(x) = 4$ and $\lim_{x \to \infty} f(x) = 54$