

## PreCalc 12 Final Review Pack Part 2 v1 Answer Section

### MULTIPLE CHOICE

- ANS: C  
Look at all statements to ensure correctness.  
  
PTS: 1                      DIF: Easy                      REF: 5.2 Analyzing Exponential Functions  
LOC: 12.RF9                TOP: Relations and Functions                      KEY: Conceptual Understanding
- ANS: D                      PTS: 1                      DIF: Easy  
REF: 5.4 Logarithms and the Logarithmic Function                      LOC: 12.RF7  
TOP: Relations and Functions                      KEY: Procedural Knowledge
- ANS: B                      PTS: 1                      DIF: Easy  
REF: 5.8 Solving Problems with Exponents and Logarithms                      LOC: 12.RF10  
TOP: Relations and Functions                      KEY: Conceptual Understanding
- ANS: D  
-.5 if missing units  
-.5 if not exact  
length must be positive.  
  
PTS: 1                      DIF: Easy                      REF: 6.2 Angles in Standard Position and Arc Length  
LOC: 12.T1                      TOP: Trigonometry  
KEY: Procedural Knowledge | Conceptual Understanding
- ANS: D  
-.5 if missing units  
length must be positive  
  
PTS: 1                      DIF: Easy                      REF: 6.3 Radian Measure  
LOC: 12.T1                      TOP: Trigonometry  
KEY: Procedural Knowledge | Conceptual Understanding
- ANS: B  
Use mnemonic ASTC  
  
PTS: 1                      DIF: Easy                      REF: 7.1 Solving Trigonometric Equations Graphically  
LOC: 12.T5                      TOP: Trigonometry                      KEY: Procedural Knowledge
- ANS: A  
Recall the sum/difference identities then simplify.  
  
PTS: 1                      DIF: Easy                      REF: 7.5 Sum and Difference Identities  
LOC: 12.T6                      TOP: Trigonometry                      KEY: Procedural Knowledge
- ANS: B                      PTS: 1                      DIF: Easy                      REF: 8.4 Combinations  
LOC: 12.PCB3                TOP: Permutations, Combinations and Binomial Theorem  
KEY: Procedural Knowledge
- ANS: A                      PTS: 1                      DIF: Easy                      REF: 8.4 Combinations  
LOC: 12.PCB3                TOP: Permutations, Combinations and Binomial Theorem  
KEY: Conceptual Understanding

10. ANS: D

Recall the basic identities and cancel.

PTS: 1                    DIF: Easy                    REF: 7.3 Reciprocal and Quotient Identities  
 LOC: 12.T6                TOP: Trigonometry                    KEY: Procedural Knowledge

11. ANS: C

The untransformed range of exponentials is  $y > 0$ . Transforms that affect the range are vertical reflection and shift.

PTS: 1                    DIF: Moderate                    REF: 5.2 Analyzing Exponential Functions  
 LOC: 12.RF9                TOP: Relations and Functions                    KEY: Conceptual Understanding

12. ANS: C

The y-intercept is affected by all transforms.

PTS: 1                    DIF: Moderate                    REF: 5.2 Analyzing Exponential Functions  
 LOC: 12.RF9                TOP: Relations and Functions  
 KEY: Procedural Knowledge | Conceptual Understanding

13. ANS: A

Determine a common base. Use logs to solve for exponents, then equate the exponents.

PTS: 1                    DIF: Moderate                    REF: 5.3 Solving Exponential Equations  
 LOC: 12.RF10                TOP: Relations and Functions                    KEY: Procedural Knowledge

14. ANS: A

Recall:  $x = \log_a a^x$

PTS: 1                    DIF: Moderate                    REF: 5.5 The Laws of Logarithms  
 LOC: 12.RF8                TOP: Relations and Functions                    KEY: Procedural Knowledge

15. ANS: C

The x-intercepts are affected by all transforms, so solve for  $0 = -5 \log_4(x + 3)$

PTS: 1                    DIF: Moderate                    REF: 5.6 Analyzing Logarithmic Functions  
 LOC: 12.RF9                TOP: Relations and Functions  
 KEY: Procedural Knowledge | Conceptual Understanding

16. ANS: C

Recall the domain is affected by horizontal scale and shift.

PTS: 1                    DIF: Moderate                    REF: 5.6 Analyzing Logarithmic Functions  
 LOC: 12.RF9                TOP: Relations and Functions  
 KEY: Procedural Knowledge | Conceptual Understanding

17. ANS: D

Algebraically:  $x \approx \frac{\log 356}{\log 4} - (5)$

PTS: 1                    DIF: Moderate                    REF: 5.7 Solving Logarithmic and Exponential Equations  
 LOC: 12.RF10                TOP: Relations and Functions                    KEY: Procedural Knowledge

18. ANS: B                      PTS: 1                      DIF: Moderate  
 REF: 5.8 Solving Problems with Exponents and Logarithms      LOC: 12.RF10  
 TOP: Relations and Functions                      KEY: Conceptual Understanding | Procedural Knowledge

19. ANS: A

The general solution is  $\frac{\pi}{2} + n\pi, n \in Z$ , so look for non-matching denominator

PTS: 1                      DIF: Moderate      REF: 6.4 Graphing Trigonometric Functions  
 LOC: 12.T4                      TOP: Trigonometry  
 KEY: Conceptual Understanding | Procedural Knowledge

20. ANS: B  
 -.5 if not exact

PTS: 1                      DIF: Moderate      REF: 6.7 Applications of Sinusoidal Functions  
 LOC: 12.T4                      TOP: Trigonometry                      KEY: Procedural Knowledge

21. ANS: A

If non-MC, you cannot use TRACE.  
 Quickly eliminate distractors that are out of the domain.  
 Use TRACE to eliminate answers that are not within +/- .1

PTS: 1                      DIF: Moderate      REF: 7.1 Solving Trigonometric Equations Graphically  
 LOC: 12.T5                      TOP: Trigonometry  
 KEY: Conceptual Understanding | Procedural Knowledge

22. ANS: C

If non-MC, you cannot use TRACE.  
 Quickly eliminate distractors that are out of the domain.  
 Use TRACE to eliminate answers that are not within +/- .1

PTS: 1                      DIF: Moderate      REF: 7.1 Solving Trigonometric Equations Graphically  
 LOC: 12.T5                      TOP: Trigonometry  
 KEY: Conceptual Understanding | Procedural Knowledge

23. ANS: D

If non-MC, you cannot use TRACE.  
 Quickly eliminate distractors that are out of the domain.  
 Use TRACE to eliminate answers that are not within +/- .1

PTS: 1                      DIF: Moderate      REF: 7.1 Solving Trigonometric Equations Graphically  
 LOC: 12.T5                      TOP: Trigonometry  
 KEY: Conceptual Understanding | Procedural Knowledge

24. ANS: B

Recall the sum/difference identities, special angles, and simplify.

PTS: 1                      DIF: Moderate      REF: 7.5 Sum and Difference Identities  
 LOC: 12.T5                      TOP: Trigonometry  
 KEY: Conceptual Understanding | Procedural Knowledge

25. ANS: D

Recall the sum/difference identities, special angles, number of solutions, ASTC, and simplify.

PTS: 1                    DIF: Moderate        REF: 7.5 Sum and Difference Identities

LOC: 12.T5                TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

26. ANS: C

These are independent events, use FCP. You can choose to have each condiments or not. *choice*<sup>events</sup>

PTS: 1                    DIF: Moderate        REF: 8.1 The Fundamental Counting Principle

LOC: 12.PCB1            TOP: Permutations, Combinations and Binomial Theorem

KEY: Procedural Knowledge | Conceptual Understanding

27. ANS: D

Use guess and test.

PTS: 1                    DIF: Moderate        REF: 8.2 Permutations of Different Objects

LOC: 12.PCB2            TOP: Permutations, Combinations and Binomial Theorem

KEY: Procedural Knowledge

28. ANS: C

This is a permutation with repetition.

PTS: 1                    DIF: Moderate        REF: 8.3 Permutations Involving Identical Objects

LOC: 12.PCB2            TOP: Permutations, Combinations and Binomial Theorem

KEY: Conceptual Understanding | Procedural Knowledge

29. ANS: D

This is a combination because order doesn't matter.

PTS: 1                    DIF: Moderate        REF: 8.4 Combinations

LOC: 12.PCB3            TOP: Permutations, Combinations and Binomial Theorem

KEY: Procedural Knowledge | Conceptual Understanding

30. ANS: D

Use logs to solve for exponents.

Recall radical definition:  $\sqrt[n]{x^m} = x^{\frac{m}{n}}$

PTS: 1                    DIF: Moderate        REF: 5.3 Solving Exponential Equations

LOC: 12.RF9              TOP: Relations and Functions            KEY: Procedural Knowledge

31. ANS: A

PTS: 1                    DIF: Moderate        REF: 5.5 The Laws of Logarithms

LOC: 12.RF8              TOP: Relations and Functions            KEY: Procedural Knowledge

32. ANS: D

-.5 if not exact

PTS: 1                    DIF: Moderate        REF: 6.6 Combining Transformations of Sinusoidal Functions

LOC: 12.T4                TOP: Trigonometry                        KEY: Procedural Knowledge

33. ANS: B  
-.5 if missing units

PTS: 1                    DIF: Moderate        REF: 6.7 Applications of Sinusoidal Functions  
LOC: 12.T4                TOP: Trigonometry  
KEY: Procedural Knowledge | Conceptual Understanding

34. ANS: B  
Recall your special angles and mnemonic ASTC.

PTS: 1                    DIF: Moderate        REF: 7.2 Solving Trigonometric Equations Algebraically  
LOC: 12.T5                TOP: Trigonometry  
KEY: Conceptual Understanding | Procedural Knowledge

35. ANS: B  
Recall the sum/difference identities, special angles, and simplify.

PTS: 1                    DIF: Moderate        REF: 7.5 Sum and Difference Identities  
LOC: 12.T5                TOP: Trigonometry  
KEY: Conceptual Understanding | Procedural Knowledge

36. ANS: D                PTS: 1                    DIF: Moderate        REF: 8.4 Combinations  
LOC: 12.PCB3              TOP: Permutations, Combinations and Binomial Theorem  
KEY: Procedural Knowledge | Conceptual Understanding

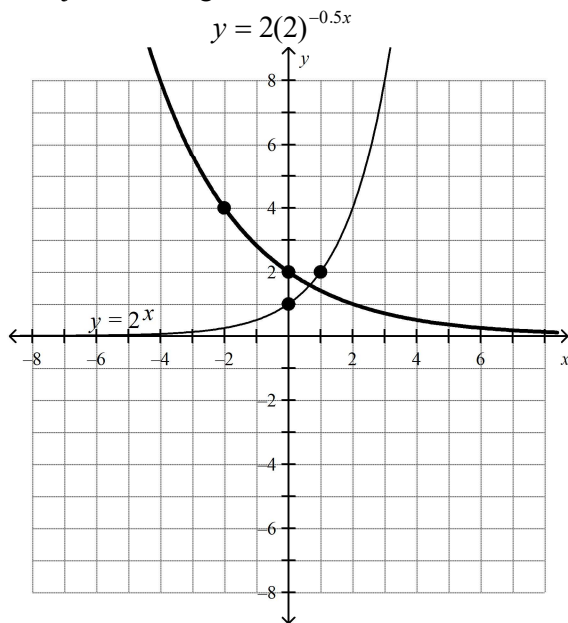
37. ANS: C  
This is a combination because order doesn't matter. A line is a combination of 2 points.

PTS: 1                    DIF: Moderate        REF: 8.4 Combinations  
LOC: 12.PCB3              TOP: Permutations, Combinations and Binomial Theorem  
KEY: Procedural Knowledge | Conceptual Understanding

## SHORT ANSWER

38. ANS:

It's best to transform some grid points and show the corresponding points.  
-1 if just showing curve.



PTS: 1                    DIF: Moderate            REF: 5.2 Analyzing Exponential Functions  
LOC: 12.RF9            TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge | Communication

39. ANS:

-1 if not exact

$$\cos\left(\frac{-13\pi}{6}\right) = \frac{\sqrt{3}}{2}$$

PTS: 1                    DIF: Moderate            REF: 6.3 Radian Measure  
LOC: 12.T3            TOP: Trigonometry  
KEY: Procedural Knowledge | Conceptual Understanding

40. ANS:

-1 if not exact

$$\frac{15\pi}{2}, \frac{17\pi}{2}, \frac{19\pi}{2}$$

PTS: 1                    DIF: Moderate            REF: 6.4 Graphing Trigonometric Functions  
LOC: 12.T4            TOP: Trigonometry  
KEY: Conceptual Understanding | Procedural Knowledge

41. ANS:

Use calculator to solve for roots.

-.5 for missing solution.

-.5 for not exact.

$$x = -\frac{11}{3}\pi \text{ or } x = -\frac{10}{3}\pi$$

PTS: 1                      DIF: Moderate              REF: 7.2 Solving Trigonometric Equations Algebraically

LOC: 12.T5                      TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

42. ANS:

-.5 for off by 1 errors

-.5 for incorrect concept

This is a permutation with repetition.

1260 numbers

PTS: 1                      DIF: Moderate              REF: 8.3 Permutations Involving Identical Objects

LOC: 12.PCB2                      TOP: Permutations, Combinations and Binomial Theorem

KEY: Conceptual Understanding | Procedural Knowledge

43. ANS:

-.5 for off by 1 errors

-.5 for incorrect concept

This is a combination because order doesn't matter. It is also FCP, so combination1\*combination2

200 selections

PTS: 1                      DIF: Moderate              REF: 8.4 Combinations

LOC: 12.PCB3                      TOP: Permutations, Combinations and Binomial Theorem

KEY: Conceptual Understanding | Procedural Knowledge

44. ANS:

-.5 for off by 1 errors

$$-243x^5 - 810x^4 - 1080x^3 - 720x^2 - 240x - 32$$

PTS: 1                      DIF: Moderate              REF: 8.6 The Binomial Theorem

LOC: 12.PCB4                      TOP: Permutations, Combinations and Binomial Theorem

KEY: Conceptual Understanding | Procedural Knowledge

45. ANS:

-.5 for off by 1 errors

-.5 for incorrect concept

This is a combination because order doesn't matter. It is also FCP, so combination1\*combination2

3630 committees

PTS: 1                      DIF: Difficult              REF: 8.4 Combinations

LOC: 12.PCB3                      TOP: Permutations, Combinations and Binomial Theorem

KEY: Conceptual Understanding | Procedural Knowledge | Problem-Solving Skills

## PROBLEM

46. ANS:

Use the power laws:

$$y = 2^{-3x+9}$$

$$y = 2^{-3(x-3)}$$

$$y = \left(2^{-3}\right)^{x-3}$$

$$y = \left(\frac{1}{2^3}\right)^{x-3}$$

$$y = \left(\frac{1}{8}\right)^{x-3}$$

The equations describe the same function, so their graphs coincide.

PTS: 1                    DIF: Moderate            REF: 5.2 Analyzing Exponential Functions

LOC: 12.RF9            TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

47. ANS:

-.5 if rounded incorrectly and/or missing units, rounding up is also acceptable.

Do all algebra before using calculator to avoid rounding errors.

Use the equation:  $A = A_0 \left(1 + \frac{i}{n}\right)^{nt}$

Substitute  $A = 1300$ ,  $A_0 = 900$ ,  $i = 0.025$ ,  $n = 12$ .

$$1300 = 900 \left(1 + \frac{0.025}{12}\right)^{12t}$$

Graph a related function:  $y = 900 \left(1 + \frac{0.025}{12}\right)^{12t} - 1300$

Determine the approximate zero of the function: 14.72431

The amount will be \$1300 in approximately 15 years.

PTS: 1                    DIF: Moderate            REF: 5.3 Solving Exponential Equations

LOC: 12.RF10            TOP: Relations and Functions

KEY: Procedural Knowledge | Conceptual Understanding | Problem-Solving Skills



48. ANS:

-.5 if not exact

-.5 if missing units

The radius of the wheel, in inches, is:  $\frac{24}{2} = 12$

The distance the wheel rolls, in inches, is:  $\frac{250}{360} (2\pi)(12) = \frac{50}{3}\pi$

The wheel rolls  $\frac{50}{3}\pi$  inches backward.

PTS: 1 DIF: Moderate REF: 6.2 Angles in Standard Position and Arc Length

LOC: 12.T1 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge | Problem-Solving Skills

49. ANS:

-.5 if not rounded correctly

$$\cos \theta = -\frac{1}{3}$$

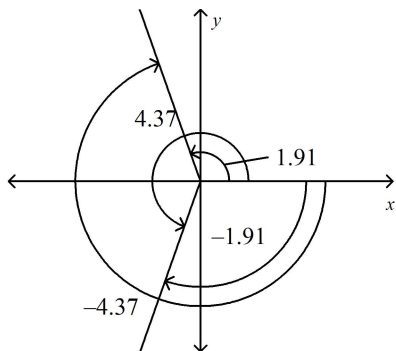
Since  $\cos \theta$  is negative, the terminal arm of angle  $\theta$  lies in Quadrant 2 or Quadrant 3.

The reference angle is:  $\cos^{-1}\left(\frac{1}{3}\right) \doteq 1.2310$

In Quadrant 2,  $\theta \doteq \pi - 1.2310$ , or 1.9106

In Quadrant 3,  $\theta \doteq \pi + 1.2310$ , or 4.3726

Sketch a diagram.



An angle that is coterminal with 1.9106 in the domain  $-2\pi \leq \theta \leq 2\pi$  is:

$$1.9106 - 2\pi = -4.3726$$

An angle that is coterminal with 4.3726 in the domain  $-2\pi \leq \theta \leq 2\pi$  is:

$$4.3726 - 2\pi = -1.9106$$

So, the possible measures of angle  $\theta$  are approximately 1.9, -4.4, 4.4, and -1.9

PTS: 1 DIF: Moderate REF: 6.3 Radian Measure

LOC: 12.T3 TOP: Trigonometry

KEY: Procedural Knowledge | Conceptual Understanding

50. ANS:

- a) The graph of  $y = \cos x$  was stretched or compressed vertically by a factor of  $|a|$ .  
If  $a < 0$ , the graph was also reflected in the  $x$ -axis.
- b) If  $d > 0$ , the graph of  $y = \tan x$  was translated  $d$  units up.  
If  $d < 0$ , the graph of  $y = \tan x$  was translated  $|d|$  units down.

PTS: 1                      DIF: Moderate              REF: 6.5 Trigonometric Functions

LOC: 12.T4                      TOP: Trigonometry

KEY: Conceptual Understanding | Communication

51. ANS:

- a) Rearrange the equation so that 0 is on one side:  $0 = \frac{1}{6} + \frac{5}{3} \cos 5\pi x$

On a graphing calculator, determine the zeros of the function  $y = \frac{1}{6} + \frac{5}{3} \cos 5\pi x$  over the domain

$$0 \leq x < \frac{2}{5}.$$

To the nearest hundredth, the solution in the domain  $0 \leq x < \frac{2}{5}$  is:  $x \doteq 0.11$  or  $x \doteq 0.29$

- b) Identify the period of the function from the equation.

The period of  $y = -\frac{1}{6} - \frac{5}{3} \cos 5\pi x$  is:  $\frac{2\pi}{5\pi} = \frac{2}{5}$

So, the general solution is approximately:  $x \doteq 0.11 + \frac{2}{5}k, k \in \mathbf{Z}$  or  $x \doteq 0.29 + \frac{2}{5}k, k \in \mathbf{Z}$

PTS: 1                      DIF: Moderate              REF: 7.1 Solving Trigonometric Equations Graphically

LOC: 12.T5                      TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge | Communication

52. ANS:

$$\begin{aligned}
 \text{R.S.} &= \frac{\cot^2 \theta}{1 + \csc \theta} + \frac{\cot^2 \theta}{1 - \csc \theta} \\
 &= \frac{\csc^2 \theta - 1}{1 + \csc \theta} + \frac{\csc^2 \theta - 1}{1 - \csc \theta} \\
 &= \frac{(\csc \theta - 1)(\csc \theta + 1)}{1 + \csc \theta} + \frac{(\csc \theta - 1)(\csc \theta + 1)}{1 - \csc \theta} \\
 &= \frac{(\csc \theta - 1)(1 + \csc \theta)}{1 + \csc \theta} - \frac{(1 - \csc \theta)(\csc \theta + 1)}{1 - \csc \theta} \\
 &= (\csc \theta - 1) - (\csc \theta + 1) \\
 &= -2 \\
 &= \text{L.S.}
 \end{aligned}$$

The left side is equal to the right side, so the identity is proved.

PTS: 1                      DIF: Moderate              REF: 7.4 The Pythagorean Identities

LOC: 12.T6                      TOP: Trigonometry

KEY: Procedural Knowledge | Conceptual Understanding | Problem-Solving Skills | Communication

53. ANS:

For  $y = \log_{(b^c)} x$ , change the base from  $b^c$  to  $b$ :

$$y = \log_{(b^c)} x$$

$$y = \frac{\log_b x}{\log_b (b^c)}$$

$$y = \frac{\log_b x}{c}$$

$$y = \frac{1}{c} \log_b x$$

So,  $y = \log_{(b^c)} x$  is equivalent to  $y = \frac{1}{c} \log_b x$ .

The graph of  $y = \log_{(b^c)} x$  is a vertical compression by a factor of  $\frac{1}{c}$  of the graph of  $y = \log_b x$ .

PTS: 1                      DIF: Difficult              REF: 5.6 Analyzing Logarithmic Functions

LOC: 12.RF9                      TOP: Relations and Functions

KEY: Conceptual Understanding | Problem-Solving Skills | Communication

54. ANS:

$$\begin{aligned}
 \text{L.S.} &= \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} \\
 &= \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} \cdot \frac{\cos \theta + \sin \theta}{\cos \theta + \sin \theta} \\
 &= \frac{\cos^2 \theta - \sin^2 \theta}{\cos^2 \theta + 2 \sin \theta \cos \theta + \sin^2 \theta} \\
 &= \frac{\cos 2\theta}{(\cos^2 \theta + \sin^2 \theta) + \sin 2\theta} \\
 &= \frac{\cos 2\theta}{1 + \sin 2\theta} \\
 &= \text{R.S.}
 \end{aligned}$$

The left side is equal to the right side, so the identity is proved.

PTS: 1                      DIF: Moderate              REF: 7.6 Double-Angle Identities

LOC: 12.T6                      TOP: Trigonometry

KEY: Procedural Knowledge | Conceptual Understanding | Communication | Problem-Solving Skills