

This test is closed-book and closed-notes. No calculator is allowed for this test. For full credit show all of your work (legibly!), unless otherwise specified. Answers should be simplified down to arithmetic expressions whenever possible – only unsimplifiable trigonometric, exponential, and trigonometric functions may be left unevaluated.

The problems are in no particular order, and it is suggested that you look at all of them before beginning to answer any.

1. **(10 points)** Answer the following questions about evaluating trigonometric expressions.

(a) **(3 points)** Evaluate the expression $\sin(75^\circ)\cos(15^\circ) - \cos(75^\circ)\sin(15^\circ)$.

(b) **(2 points)** Evaluate $\arccos \frac{-\sqrt{2}}{2}$.

(c) **(2 points)** Evaluate $\arctan \frac{1}{\sqrt{3}}$.

(d) **(4 points)** Evaluate $\tan \arcsin(\frac{12}{13})$.

1	/10
2	/ 8
3	/10
4	/15
5	/ 7
6	/10
Σ	/60

2. **(8 points)** Identify each of the following sequences as arithmetic, geometric, or neither, and find a formula for each sequence.

(a) **(2 points)** 5, 10, 20, 40, 80, . . .

(b) **(2 points)** 7, 5, 3, 1, -1, . . .

(c) **(2 points)** $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \dots$

(d) **(2 points)** -4, 10, -25, $\frac{125}{2}, \frac{-625}{4}, \dots$

3. **(10 points)** Answer the following questions about trigonometric equations.

(a) **(3 points)** Find *any one* solution to the equation $3 \cos(2x) + 7 = 10$.

(b) **(3 points)** Find *all* solutions to the equation $2 \tan(3x) + 6 = 4$.

(c) **(4 points)** Verify the trigonometric identity $\frac{\sin \theta}{\csc \theta \cos \theta} = \sec \theta - \cos \theta$.

4. **(15 points)** Answer the following questions about series.

(a) **(2 points)** Evaluate $\sum_{j=2}^5 2j^2$.

(b) **(2 points)** Express $\sqrt{1} + \sqrt{2} + \sqrt{3} + \sqrt{4} + \cdots + \sqrt{70}$ in sigma notation.

(c) **(3 points)** Calculate the sum of the first 20 terms of the arithmetic series with first term 5 and common difference -3 .

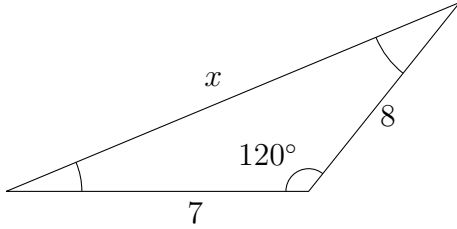
(d) **(3 points)** Calculate the arithmetic series partial sum $6 + 8 + 10 + 12 + 14 + \cdots + 104$.

(e) **(3 points)** Find the geometric series partial sum $4 - 12 + 36 - 108 + 324 - \cdots + 4 \cdot 3^{10}$.
You may leave *one* unreduced exponent in your answer.

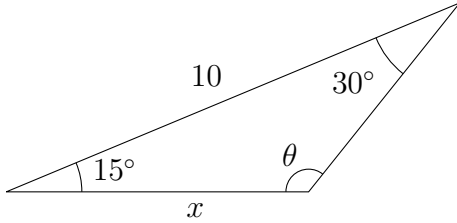
(f) **(2 points)** Evaluate the geometric series infinite sum $5 + 4 + \frac{16}{5} + \frac{64}{25} + \frac{256}{125} + \cdots$.

5. (7 points) Calculate the labeled quantities in the triangles (not drawn to scale) below.

(a) (3 points) Determine x :



(b) (4 points) Determine x and θ :



6. (10 points) Answer the following questions about sequence exploration.

(a) (4 points) The fifth term of an arithmetic sequence is 4 and the eleventh term is 40. What is the formula for the sequence?

(b) (3 points) An arithmetic sequence has formula $a_n = 5 - 3n$. Which term in this sequence is equal to -34 ?

(c) (3 points) The first term of a geometric sequence is 8, and the second term is 4. What is the fifth term?