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 and exponential functions may be left unevaluated.

1. **(10 points)** Answer the following questions about series.

   (a) **(2 points)** Express $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \cdots + \frac{1}{20}$ in sigma notation.

   (b) **(4 points)** Calculate the arithmetic series partial sum $3 + 7 + 11 + 15 + 19 + \cdots + 79$.

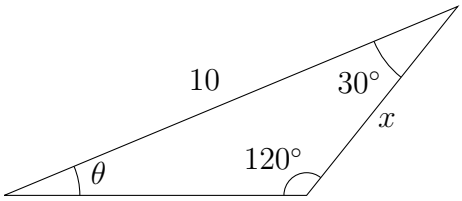
   (c) **(2 points)** Evaluate $\sum_{k=4}^{7} (k^2 - k)$.

   (d) **(2 points)** Evaluate the geometric series infinite sum $4 - 1 + \frac{1}{4} - \frac{1}{16} + \frac{1}{64} - \frac{1}{256} + \cdots$

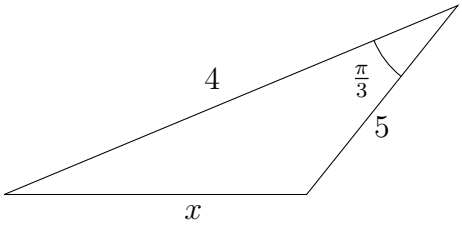
1	/10
2	/10
3	/12
4	/10
5	/ 8
6	/10
Σ	/60

2. **(10 points)** Calculate the labeled quantities in the triangles (not drawn to scale) below.

   (a) **(5 points)** Determine x and θ:



   (b) **(5 points)** Determine x:



3. **(12 points)** Answer the following questions about trigonometric equations.

   (a) **(4 points)** Find *all* solutions to the equation $6\sin(2x) = -3\sqrt{3}$.

   (b) **(4 points)** Find *any one* solution to the equation $4\sec(3x) - 2 = 6$.

   (c) **(4 points)** Verify the trigonometric identity $\frac{1-\sin x}{1+\sin x} = (\sec x - \tan x)^2$.

4. **(10 points)** Answer the following questions about evaluating trigonometric expressions.

   (a) **(2 points)** Evaluate $\arctan(-1)$.

   (b) **(4 points)** Evaluate $\csc\big(\arctan(\frac{3}{4})\big)$.

   (c) **(2 points)** Evaluate $\arcsin\frac{1}{2}$.

   (d) **(3 points)** Evaluate the expression $\cos(55^\circ)\cos(10^\circ) + \sin(55^\circ)\sin(10^\circ)$.

5. **(8 points)** Identify each of the following sequences as arithmetic, geometric, or neither, and find a formula for each sequence.

   (a) **(2 points)** $1, 4, 9, 16, 25, \ldots$.

   (b) **(2 points)** $27, 9, 3, 1, \frac{1}{3}, \ldots$.

   (c) **(2 points)** $5, 2, -1, -4, -7, -10, \ldots$.

   (d) **(2 points)** $3, -3, 3, -3, 3, -3, \ldots$.

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

   (a) **(4 points)** The third term of an arithmetic sequence is 19 and the seventh term is 3. What is the formula for the sequence?

   (b) **(3 points)** An arithmetic sequence has formula $a_n = 6 + 9(n - 1)$. Which term in this sequence is equal to 114?

   (c) **(3 points)** The first term of a geometric sequence is 9, and the second term is -3. What is the sixth term?