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. Unless degrees are explicitly presented as the units, all angle measurements are in radians.

1. **(16 points)** Answer the following questions about evaluating trigonometric expressions.

   (a) **(6 points)** Evaluate $\cot\big(\arcsin(\frac{5}{13})\big)$.

   (b) **(3 points)** Evaluate $\arccos\frac{-\sqrt{3}}{2}$, giving your answer in radians.

   (c) **(3 points)** Evaluate $\arctan 1$, giving your answer in radians.

   (d) **(4 points)** Find the value, in terms only of square roots, of $\cos 165°$.

2. **(12 points)** Answer the following questions about trigonometry.

   (a) **(4 points)** Find the terminal point associated with $t = \frac{14\pi}{3}$.

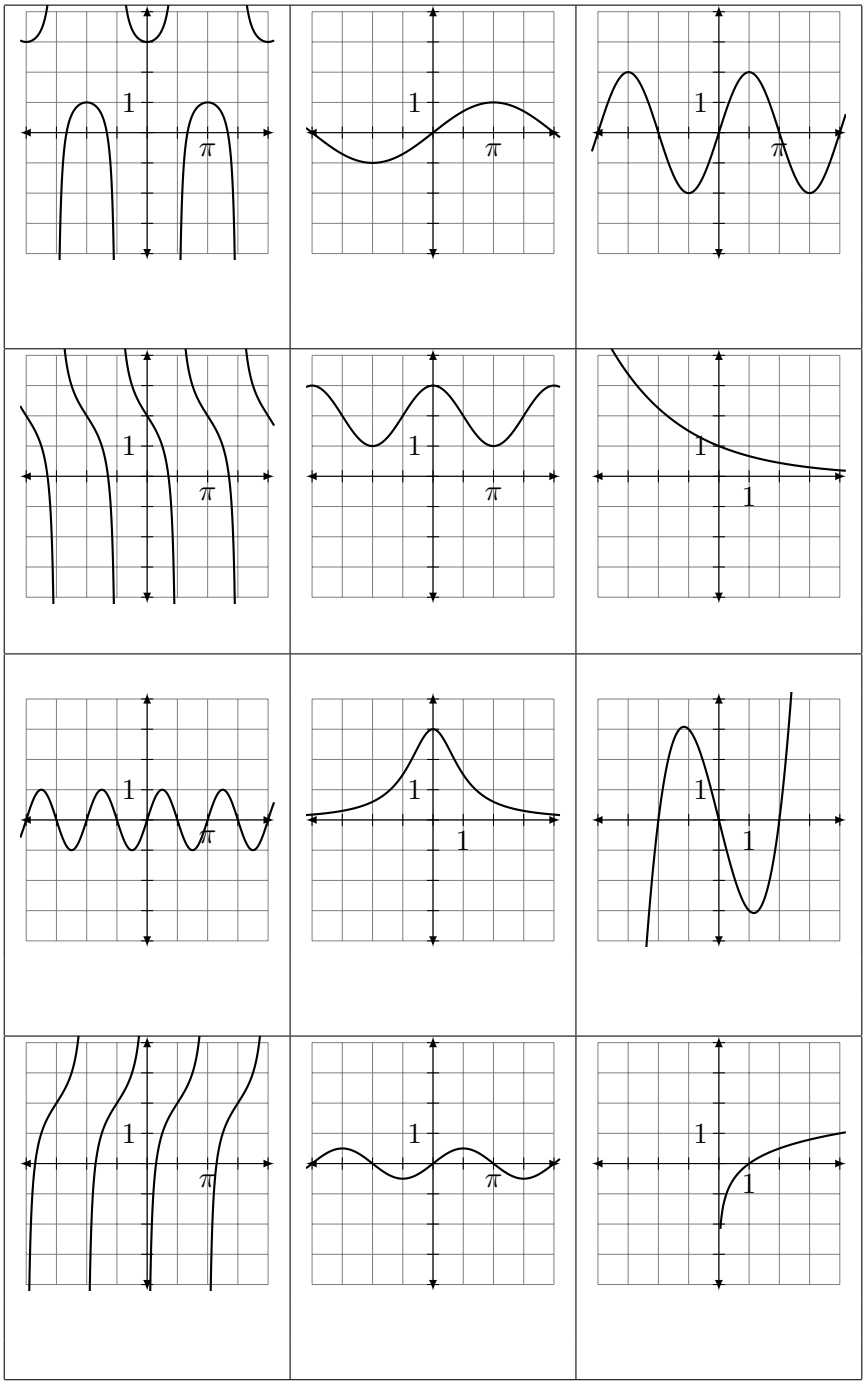
   (b) **(4 points)** Identify the period, amplitude, and vertical shift of the periodic function $g(x) = 4 - 2\cos(\frac{x}{5})$.

   (c) **(4 points)** Evaluate $\csc\frac{5\pi}{4}$.

3. **(12 points)** The following twelve graphs are of the following functions:

$$A(x) = 2\sin x \qquad B(x) = \sin(2x) \qquad C(x) = \frac{1}{2}\sin x$$
$$D(x) = \sin\left(\frac{x}{2}\right) \qquad E(x) = 2 - \tan x \qquad F(x) = 2 - \cot x$$
$$G(x) = \frac{3}{x^2+1} \qquad H(x) = \left(\frac{2}{3}\right)^x \qquad I(x) = \log_4 x$$
$$J(x) = x^3 - 4x \qquad K(x) = (\cos x) + 2 \qquad L(x) = (\sec x) - 2$$

Label each picture with the letter of the appropriate function.



4. **(20 points)** Answer the following questions about trigonometric equations.

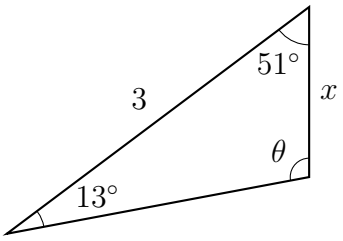
   (a) **(8 points)** Find *all* solutions to the equation $4\sin\frac{q}{5} = -2\sqrt{2}$.

   (b) **(6 points)** Find *any one* solution to the equation $(\tan^2\theta - 3)(2\cos\theta + 1) = 0$.

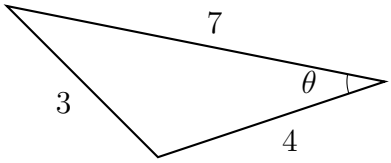
   (c) **(6 points)** Verify the trigonometric identity $\tan x + \cot x = \sec x \csc x$.

5. **(20 points)** Determine the values of the labeled quantities in the triangles (not drawn to scale) below. *Trignometric and inverse trigonometric expressions need not be simplified!*

   (a) **(8 points)** Determine x and θ:



   (b) **(6 points)** Determine θ:



   (c) **(6 points)** Determine x: