Final (Practice)

There are 14 problems worth 10 points each. The exam will be scored out of 120, with a score exceeding 100% being possible. Show all of your work for full credit.

1. Find all real solutions to the equation.

$$|2x - 5| = 9$$

2. Find all real solutions to the equation.

$$3^{2x-1} = 2^{4x+1}$$

3. Determine whether the lines are parallel, perpendicular, or neither.

$$y = 2x + 3 \quad 2y - 4x - 5 = 0$$

4. Solve the inequality and express the solution using interval notation.

$$3x^2 - 3x < 2x^2 + 4$$

5. Solve the inequality and express the solution using interval notation.

$$\frac{x+2}{x+3} < \frac{x-1}{x-2}$$

6. Find $f(g(h(x)))$.

$$f(x) = x^4 + 1 \quad g(x) = x - 5 \quad h(x) = \sqrt{x}$$

7. Express the quadratic $f(x)$ in vertex form $a(x-h)^2+k$. Classify the vertex as a maximum or a minimum.

$$f(x) = 3x^2 - 12x + 13$$

8. Find all rational zeros of the polynomial and write in factored form.

$$P(x) = 4x^3 - 7x + 3$$

9. If $\cos t = \frac{3}{5}$ and t is in quadrant IV, find $\cot t$.

10. Use an addition or subtraction formula to find the exact value of the expression.

$$\cos\left(\frac{11\pi}{12}\right)$$

11. Solve the equation.

$$\sin 2\theta - \sin \theta = 0$$

12. Verify the following identity.

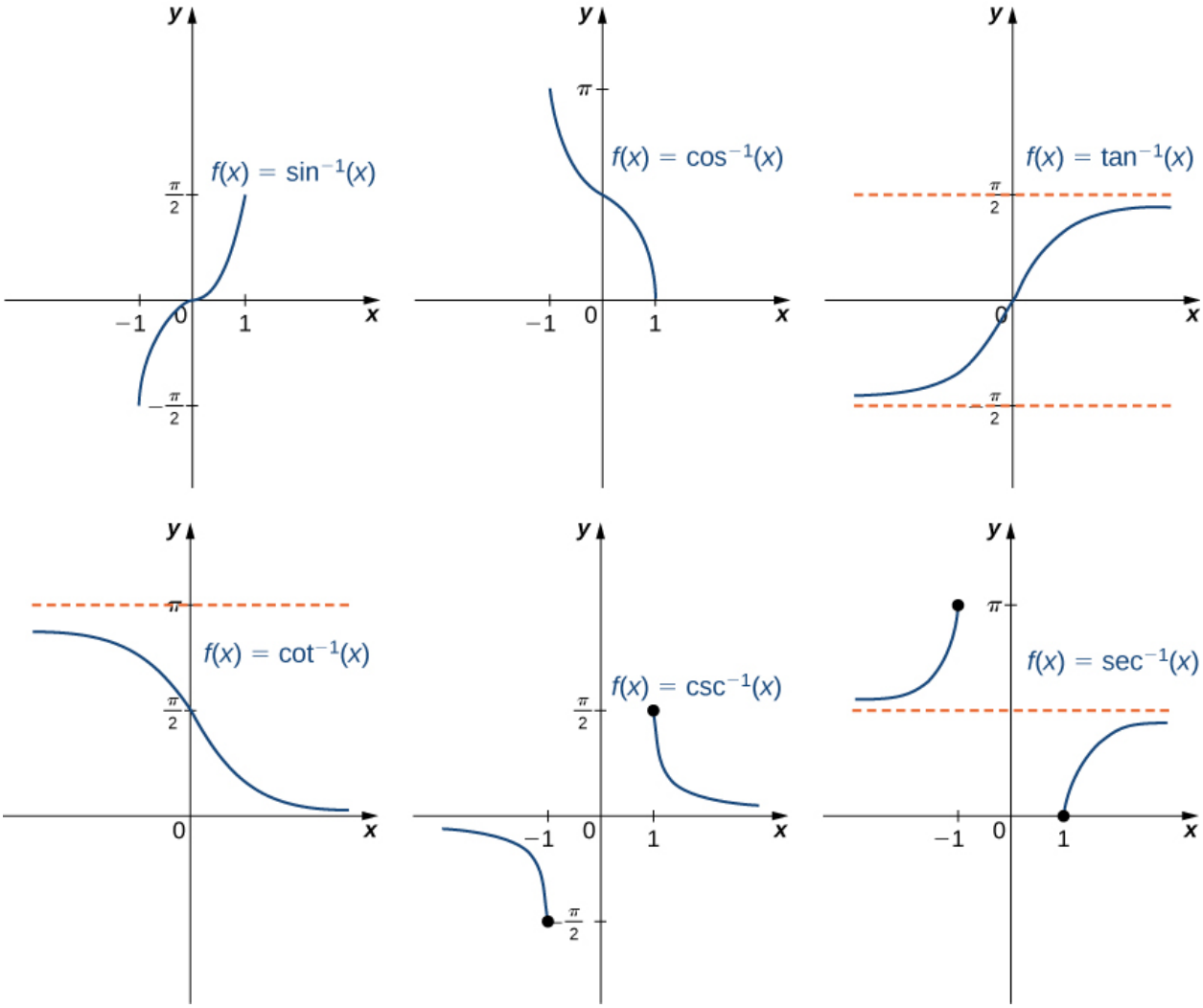
$$\frac{1+\tan x}{1-\tan x} = \frac{\cos x + \sin x}{\cos x - \sin x}$$

13. Find two numbers whose sum is 34 and whose difference is 10.

14. Solve the following system or show that it has no solution.

$$\begin{cases} x + y + z & = 4 \\ x + 3y + 3z & = 10 \\ 2x + y - z & = 3 \end{cases}$$

Graphs of the 6 inverse trig functions:



Addition and subtraction formulas:

$$\begin{aligned}
\sin(x+y) &= \sin(x)\cos(y) + \cos(x)\sin(y) \\
\sin(x-y) &= \sin(x)\cos(y) - \cos(x)\sin(y) \\
\cos(x+y) &= \cos(x)\cos(y) - \sin(x)\sin(y) \\
\cos(x-y) &= \cos(x)\cos(y) + \sin(x)\sin(y) \\
\tan(x+y) &= \frac{\tan x + \tan y}{1 - \tan x \tan y} \\
\tan(x-y) &= \frac{\tan x - \tan y}{1 + \tan x \tan y}
\end{aligned}$$

Double-Angle formulas:

$$\begin{aligned}
\sin(2x) &= 2\sin x \cos x \\
\cos(2x) &= \cos^2 x - \sin^2 x \\
&= 1 - 2\sin^2 x \\
&= 2\cos^2 x - 1 \\
\tan(2x) &= \frac{2\tan x}{1 - \tan^2 x}
\end{aligned}$$

Lowering Powers

$$\begin{aligned}
\sin^2 x &= \frac{1 - \cos 2x}{2} \\
\cos^2 x &= \frac{1 + \cos 2x}{2} \\
\tan^2 x &= \frac{1 - \cos 2x}{1 + \cos 2x}
\end{aligned}$$

Half Angle formulas

$$\begin{aligned}
\sin\frac{u}{2} &= \pm\sqrt{\frac{1 - \cos u}{2}} \\
\cos\frac{u}{2} &= \pm\sqrt{\frac{1 + \cos u}{2}} \\
\tan\frac{u}{2} &= \frac{1 - \cos u}{\sin u} = \frac{\sin u}{1 + \cos u}
\end{aligned}$$

The choice of the $+$ or $-$ sign depends on the quadrant in which $u/2$ lies.