EXAM 2 - MATH 131 Thursday, October 6

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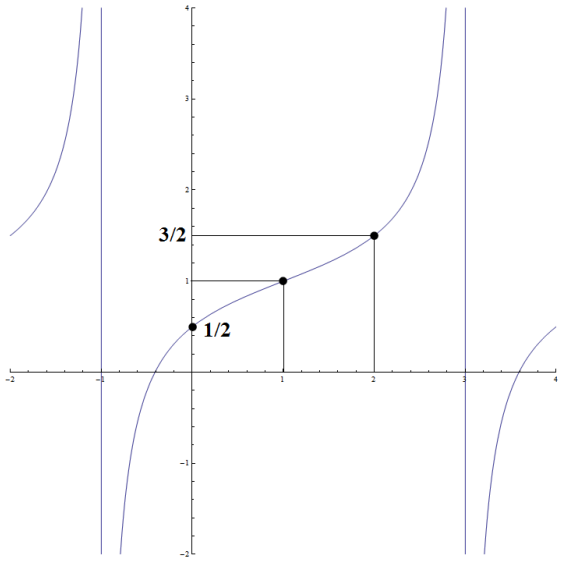
Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Consider the function $f(x) = 3\csc\left(\pi x + \frac{\pi}{2}\right) - 1$. Show all steps in finding the vertical stretch factor, the period, the phase shift and the midline, and the sketch the graph of $y = f(x)$.

(b) The graph of $y = f(x)$ in the figure is a transform of $y = \tan x$. Show all steps in identifying the parameters A, B, C and D, and then give a complete formula for $f(x)$.



2. (a) Compute the exact value of $\cos\left(\tan^{-1}(5)\right)$.

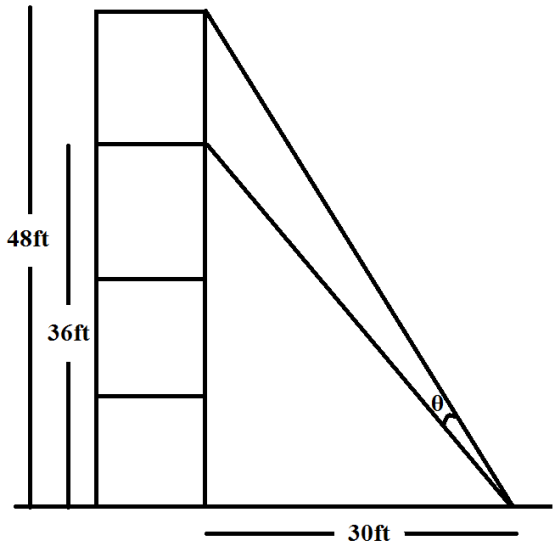
(b) Suppose a 13-foot ladder is leaning against a building, reaching to the bottom of a second-floor window 12 feet above the ground. What angle, in radians, does the ladder make with the building? (Make a figure and show all your steps.)

3. (a) Show that $\dfrac{\csc^2\theta}{\csc^2\theta - 1} = \sec^2\theta$.

(b) Simplify $(1 - \sin^2 x)(1 + \tan^2 x)$.

4. Assume $\tan\alpha = 3$, $\pi < \alpha < \frac{3\pi}{2}$, and $\sin\beta = \frac{1}{5}$, $\frac{\pi}{2} < \beta < \pi$. Compute the exact values of $\sin(\alpha+\beta)$ and $\cos(\alpha+\beta)$.

5. Two wires are attached to the side of a 4-story building as shown in the figure.



(i) Find the exact value of the tangent of the angle θ formed by the two wires.

(ii) Use your calculators to find the approximate value of the angle θ in degrees rounded to two decimal digits.