Exam 1 Day

1. [15 points] If $f(x) = \cos x$ and $g(x) = \sqrt[3]{5 - x^2}$, find the functions $f \circ f$, $g \circ f$ and their derivatives. Do not simplify the results.

2. Find the limit, if it exists. If the limit does not exist explain why. Show all the necessary steps. You can use any method.

(a) [10 points] $\lim_{x \to -2} \dfrac{\sqrt{x+3} - 1}{x+2}$,

(b) [10 points] $\lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$, if $f(x) = 3x^2 - 5x$.

3. [20 points] A ladder 13 feet long rests against a vertical wall. If the bottom of the ladder slides away from the wall at the rate of 0.5 ft/sec. At what rate is the angle between the ladder and the ground changing when the bottom of the ladder is 5 feet from the wall?

4. [20 points] Find an equation of the tangent line to the curve $\sqrt{y+x} - \sqrt{y-x} = 2$ at the point $(4, 5)$.

5. [10 points] Find the second derivative of the function $f(x) = x \sin x$.

6. [15 points] Find all vertical and horizontal asymptotes of the function $y = \dfrac{x^2 - 9}{x^3 + x^2 - 6x}$. Sketch its graph (2 points out of 15 for the graph).