Calculus Midterm
There are seven problems. Each is worth 7 points.

What is the area $f(x)$ under the line $u(x) = 6 - x$ above the interval from 2 to x? What is the derivative of this $f(x)$?

Find two different pairs $f(y)$, $g(x)$ so that $f(g(x)) = \sqrt{1-x^2}$.

Find the fixed point for $F(x) = ax + s$. When is it attracting?

If a patient's pulse measures 70, then 80, then 120, what least squares value minimizes $(x-70)^2 + (x-80)^2 + (x-120)^2$? If the patient got nervous, assign 120 a lower weight and minimize $(x-70)^2 + (x-80)^2 + \frac{1}{2}(x-120)^2$.

$$\lim_{x \to 0} \frac{2x \tan x}{\sin x}$$

Find the limit if it exists.

Find numbers A and B so that the straight line $y = x$ fits smoothly with the curve $Y = A + Bx + x^2$ at $x = 1$. Smoothly eans that $y = Y$ and $dy/dx = dY/dx$ at $x = 1$.

If the parabolas $y = x^2 + 1$ and $y = x - x^2$ come closest at $(a, a^2 + 1)$ and $(c, c - c^2)$, set up two equations for a and c.