1.(10pts) Find the point on the line $y = 3x + 5$ that is closest to the point $(1, 1)$.

2.(40pts) Evaluate the following integrals.
   
   (i) $\int (1-x)(3+x^4) \, dx$
   
   (ii) $\int_0^{\pi/4} \frac{1+\cos^2 x}{\cos^2 x} \, dx$
   
   (iii) $\int_{-5}^{5} |x^2 - 4| \, dx$
   
   (iv) $\int \sin 6x \, dx$
   
   (v) $\int \frac{1+x}{1+x^2} \, dx$
   
   (vi) $\int 2x(x^2 + 5)^7 \, dx$
   
   (vii) $\int \frac{(\ln x)^3}{x} \, dx$
   
   (viii) $\int_0^1 \frac{\tan^{-1} x}{x} \, dx$

3.(10pts) Evaluate $\frac{d}{dx} \int_0^x \sec t \, dt$.

4.(15pts) Find the area of the region bounded by the given curves:
   
   (i) $x = 1 - y^2$ and $x = y^2 - 1$.
   
   (ii) $y = x^2$ and $y = \frac{2}{x^2+1}$.

5.(15pts) Find the volume of the solid obtained by rotating the region bounded the given curves about the specified line.
   
   (i) $y = \sec x$, $y = 1$, $x = -1$, $x = 1$ about the $x$-axis.
   
   (ii) $y = x$, $y = x^2$ about $x = 3$. 