Note ♯2 (Projections, Vector Functions and Parametric Curves, Inverse Trigonometric Functions.)

[**Projections**]

(1) Find the vector and scalar projection of $\langle 4, 8\rangle$ onto $\langle 2, 1\rangle$.

(2) Find the vector and scalar projection of $\langle 2, 1\rangle$ onto $\langle 4, 8\rangle$.

(3) Find the distance from the point $P(2,1)$ to the line $y = 3x + 1$.

[Vector Functions and Parametric Curves]

(4) Eliminate the parameter to find the Cartesian equation of the curve. Sketch the curve and indicate with an arrow the direction in which the curve is traced as the parameter increases.

(a) $x = 2t - 1$, $y = 2 - t$, $-2 \leq t \leq 2$.

(b) $x = 2t - 1$, $y = t^2 - 1$.

(c) $x = 3\cos\theta,\ y = 4\sin\theta,\ 0 \leq \theta \leq 2\pi$.

(5) Find a vector equation for the line passing through $(1, 3)$ and $(-2, 7)$.

[Inverse Trigonometric Functions]

(6) Find the exact value of the expression.

(a) $\sin\left(\arccos\frac{4}{5}\right)$

(b) $\sin\left(2\sin^{-1}\frac{3}{5}\right)$

(7) Simplify each expression.

(a) $\tan(\sin^{-1} x)$

(b) $\sin(\arctan x)$