# Math 143 Midterm 2

Name: _____

**1.** Find the parametric equations for the line in $\mathbb{R}^3$ that contains the point $(1, 2, 3)$ and is perpendicular to both $\langle 1, 0, 4 \rangle$ and $\langle -1, 1, 2 \rangle$.

**2.** Find the values of $t$ for which the parametric curve $\begin{cases} x = 2t^2 \\ y = t^4 - t^3/3 \end{cases}$ for $t \in \mathbb{R}$ is concave down.

**3.** Square both sides of $e^{it} = \cos t + i \sin t$. Then use that calculation to explain why this identity is true:

$$\cos(2t) = \cos^2 t - \sin^2 t$$

**4.** Find the equation of the line tangent to the polar curve $r = 1/(1 + \cos\theta)$ at $\theta = \pi/2$.

**5.** Find the area inside the polar curve $r = \cos(3\theta)$ but outside the polar curve $r = \sin(3\theta)$.

*Do not evaluate the integrals, just set the integrals up!*