First & Last Name: ______________________________ Student ID: ________________

Math 2310 Multivariable Calculus III Quiz 2 version a

Instructions: No notes or calculators are allowed. Please box your final answer.

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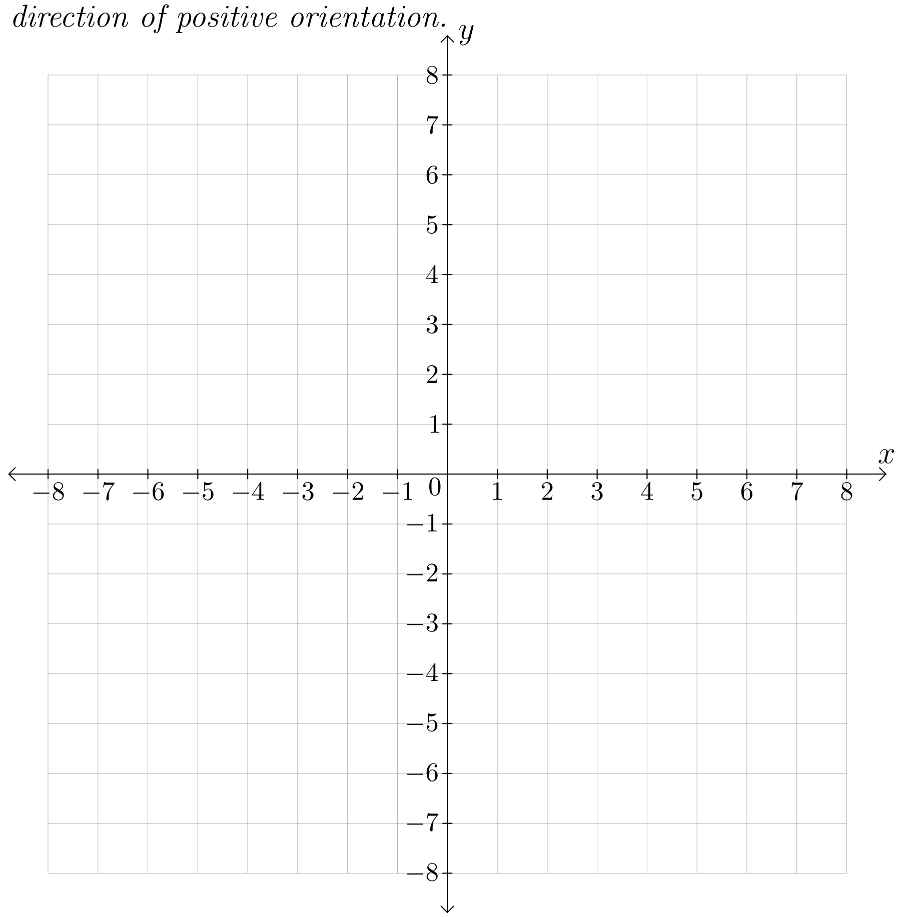
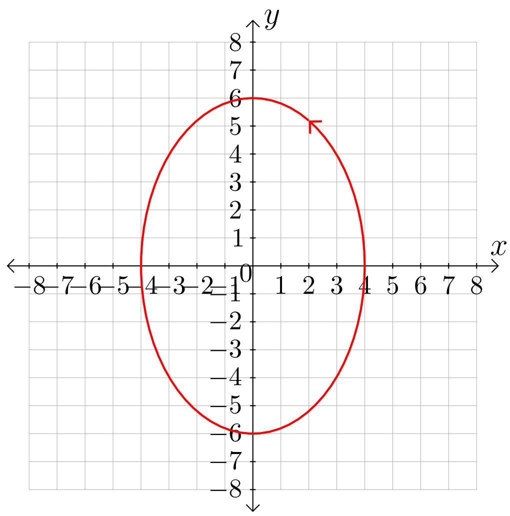
1. (4 pts) a.) Graph the curve described by the following.

$$\mathbf{r}(t) = \langle\ 4\cos t,\ 6\sin t\ \rangle \quad \text{for } 0 \le t \le 2\pi$$

b.) *Indicate the direction of positive orientation.*



Solution: See MML Section 14.2 Problems 4



$\boxed{\textbf{2.}\ (4\text{ pts})}$ Recall that the *unit tangent vector* for a smooth curve $\mathbf{r}$ is $\mathbf{T}(t) = \dfrac{\mathbf{r}'(t)}{|\mathbf{r}'(t)|}$.
Consider the parametrized curve for a circle

$$\mathbf{r}(t) = \langle\ 10,\ 3\cos t,\ 3\sin t\ \rangle$$

a.) Differentiate $\mathbf{r}(t)$.
b.) Find the unit tangent vector $\mathbf{T}(t)$ for $\mathbf{r}(t)$.

Solution: See Textbook Section 14.2 Example 2 (b). See also MML Section 14.2 Problem 7.

$$\begin{aligned}
\mathbf{r}'(t) &= \boxed{\langle 0, -3\sin t, 3\cos t\rangle} \\
|\mathbf{r}'(t)| &= \sqrt{0^2 + 3^2\sin^2 t + 3^2\cos^2 t} = \sqrt{3^2(\sin^2 t + \cos^2 t)} = \sqrt{3^2(1)} = 3 \\
\mathbf{T}(t) &= \frac{\mathbf{r}'(t)}{|\mathbf{r}'(t)|} = \frac{1}{3}\langle 0, -3\sin t, 3\cos t\rangle = \boxed{\langle 0, -\sin t, \cos t\rangle}
\end{aligned}$$

$\boxed{\textbf{3.}\ (2\text{ pts})}$ Consider the following equation of a quadric surface.

$$x = 4 - 2y^2 - 9z^2$$

Find an equation of the xz-trace or state that the xz-trace doesn't exist.

Solution: To find the xz-trace, set the "missing" variable y to 0. The equation of the xz-trace is $x = 4 - 9z^2$.
See MML Section 13.6 problems 8–10.