First & Last Name: _____ Student ID: _____

Math 2310 Multivariable Calculus III Quiz 2 version b

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

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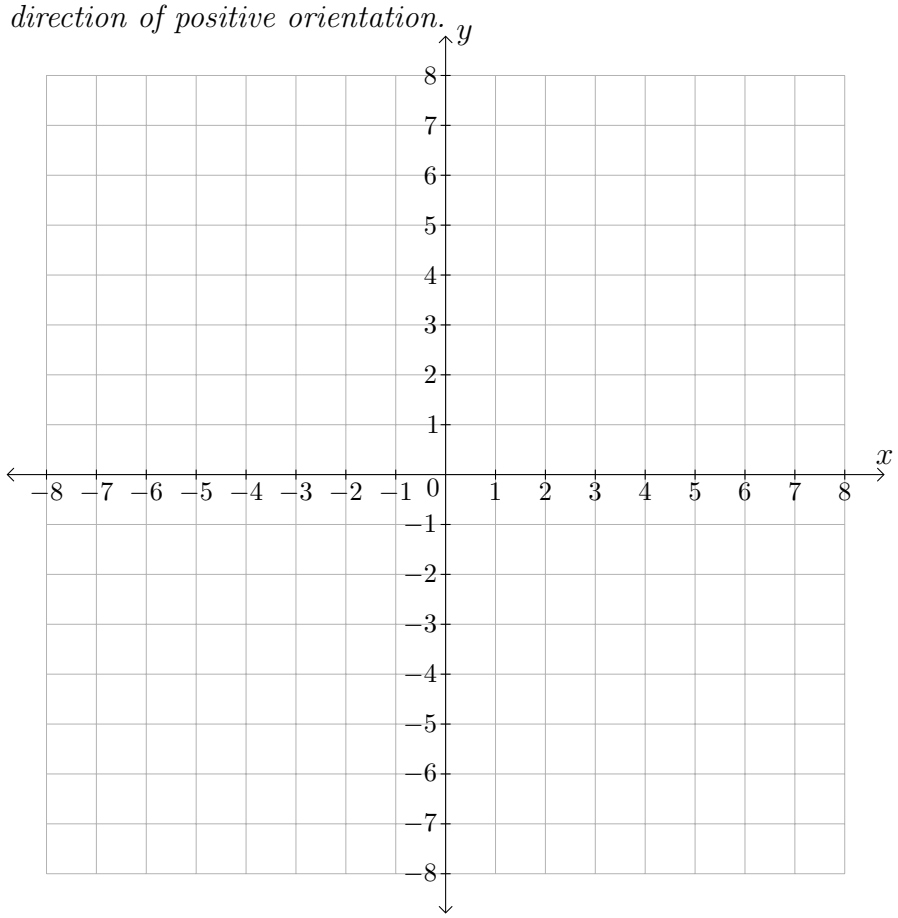
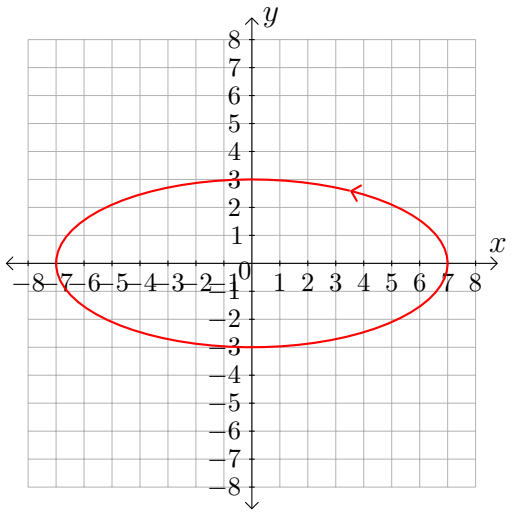
1. (4 pts) a.) Graph the curve described by the following.

$$\mathbf{r}(t) = \langle\ 7\cos t,\ 3\sin t\ \rangle \quad \text{for } 0 \le t \le 2\pi$$

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



Solution: See MML Section 14.2 Problems 4



2. (4 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

$$\mathbf{r}(t) = \langle\ 10,\ 5\cos t,\ 5\sin t\ \rangle$$

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.

$$\mathbf{r}'(t) = \boxed{\langle 0, -5\sin t, 5\cos t\rangle}$$
$$|\mathbf{r}'(t)| = \sqrt{0^2 + 5^2\sin^2 t + 5^2\cos^2 t} = \sqrt{5^2(\sin^2 t + \cos^2 t)} = \sqrt{5^2(1)} = 5$$
$$\mathbf{T}(t) = \frac{\mathbf{r}'(t)}{|\mathbf{r}'(t)|} = \frac{1}{5}\langle 0, -5\sin t, 5\cos t\rangle = \boxed{\langle 0, -\sin t, \cos t\rangle}$$

3. (2 pts) Consider the following equation of a quadric surface.

$$x = 9 - 3y^2 - 5z^2$$

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 $x = 9 - 5z^2$.
See MML Section 13.6 problems 8–10.