Student: Phong Vo **Date:** 02/16/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 12.8 Homework

1. An object moves on a trajectory given by $\mathbf{r}(t) = \langle 15\cos 6t, 15\sin 6t\rangle$ for $0 \le t \le \pi$. How far does it travel?

The object travels 90π units.
(Type an exact answer, using π as needed.)

2. Is the curve $\mathbf{r}(t) = \langle \cos t, \sin t\rangle$ parametrized by its arc length? Explain.

Choose the correct answer below.

- **A.** Yes. The curve is parametrized by its arc length because $|\mathbf{v}(t)| = 1$ for all t. ✓
- **B.** Yes. The curve is parametrized by its arc length because $|\mathbf{v}(t)| = t$ for all t. Thus, $|\mathbf{v}(t)| = 1$ for $t = 1$.
- **C.** No. The curve is not parametrized by its arc length because $|\mathbf{v}(t)| = \cos t - \sin t$.
- **D.** No. The curve is not parametrized by its arc length because $|\mathbf{v}(t)| = |\mathbf{r}(t)|$ for all t.

3. Find the length of the following two-dimensional curve.

$$\mathbf{r}(t) = \langle 10\cos t, 10\sin t\rangle, \text{ for } 0 \le t \le \pi$$

The length of the curve is 10π.
(Type an exact answer, using π as needed.)

4. Find the length of the following three-dimensional curve.

$$\mathbf{r}(t) = \langle 5 + 2t, 8 - 3t, -6 + 3t\rangle, \text{ for } 1 \le t \le 8$$

L = $7\sqrt{22}$
(Type an exact answer, using radicals as needed.)

5. For the following trajectory, find the speed associated with the trajectory and then find the length of the trajectory on the given interval.

$$\mathbf{r}(t) = \left\langle 4t^3, -t^3, 7t^3\right\rangle, \text{ for } 0 \le t \le 5$$

The speed associated with the trajectory is $\sqrt{594}\,t^2$.
(Type an exact answer, using radicals as needed.)

The length of the trajectory on the given interval is $125\sqrt{66}$ units.
(Type an exact answer, using radicals as needed.)

6. Determine whether the following curve uses arc length as a parameter. If not, find a description that uses arc length as a parameter.

   $\mathbf{r}(t) = \langle 2t, -3t \rangle$, for $0 \le t \le 3$

   Choose the correct answer below.

   A. $\mathbf{r}_1(s) = \left\langle \frac{2}{\sqrt{13}}s, -\frac{3}{\sqrt{13}}s \right\rangle$, for $0 \le s \le 3$

   B. $\mathbf{r}_1(s) = \langle 2s, -3s \rangle$, for $0 \le s \le 3\sqrt{13}$

   C. $\mathbf{r}_1(s) = \langle 26s, -39s \rangle$, for $0 \le s \le 3$

   D. $\mathbf{r}_1(s) = \left\langle \frac{2}{\sqrt{13}}s, -\frac{3}{\sqrt{13}}s \right\rangle$, for $0 \le s \le 3\sqrt{13}$

   E. The given curve uses arc length as a parameter.

7. Find the length of the following polar curve.

   The complete circle $r = 15 \sin \theta$

   The length of the curve is 15π.
   (Type an exact answer, using π as needed.)

8. Find the length of the following polar curve.

   The complete cardioid $r = 2 + 2 \cos \theta$

   The length of the curve is 16.
   (Type an exact answer, using π as needed.)

9. Determine whether the following curve uses arc length as a parameter. If not, find a description that uses arc length as a parameter.

   $\mathbf{r}(t) = \langle 3t, 5t \rangle$, for $0 \le t \le 2$

   Choose the correct answer below.

   A. $\mathbf{r}_1(s) = \langle 102s, 170s \rangle$, for $0 \le s \le 2$

   B. $\mathbf{r}_1(s) = \left\langle \frac{3}{\sqrt{34}}s, \frac{5}{\sqrt{34}}s \right\rangle$, for $0 \le s \le 2\sqrt{34}$

   C. $\mathbf{r}_1(s) = \left\langle \frac{3}{\sqrt{34}}s, \frac{5}{\sqrt{34}}s \right\rangle$, for $0 \le s \le 2$

   D. $\mathbf{r}_1(s) = \langle 3s, 5s \rangle$, for $0 \le s \le 2\sqrt{34}$

   E. The given curve uses arc length as a parameter.

10. Determine whether the following curve uses arc length as a parameter. If not, find a description that uses arc length as a parameter.

$\mathbf{r}(t) = \langle 12\,\mathbf{cos}\,t, 12\,\mathbf{sin}\,t\rangle$, for $0 \le t \le \pi$

Choose the correct answer below.

- **A.** $\mathbf{r}_1(s) = \left\langle 12\,\mathbf{cos}\,\frac{s}{12}, 12\,\mathbf{sin}\,\frac{s}{12}\right\rangle$, for $0 \le s \le 12\pi$
- **B.** $\mathbf{r}_1(s) = \langle \mathbf{cos}\,s, \mathbf{sin}\,s\rangle$, for $0 \le s \le \frac{\pi}{12}$
- **C.** $\mathbf{r}_1(s) = \left\langle \mathbf{cos}\,\frac{s}{12}, \mathbf{sin}\,\frac{s}{12}\right\rangle$, for $0 \le s \le \pi$
- **D.** $\mathbf{r}_1(s) = \langle 12\,\mathbf{cos}\,s, 12\,\mathbf{sin}\,s\rangle$, for $0 \le s \le 12\pi$
- **E.** The given curve uses arc length as a parameter.