

All necessary work must be shown for credit. Your write up should be in pencil. You may NOT use computers, notes or texts. You can use your calculators. All of your team members must help. You cannot have more than 4 team members. Each team member's printed name must be on the left and the written name must be on the right. Your signature means you only worked with team members on this problem. All of the team members below are to work on the following problem together. Each team is to turn in only ONE write up on one side of each of the two sheets given.

- |                    |                   |
|--------------------|-------------------|
| 1. <u>KEY WEST</u> | 1. <u>Tur Key</u> |
| 2. _____           | 2. _____          |
| 3. _____           | 3. _____          |
| 4. _____           | 4. _____          |

1. A chief engineer has lost or misplaced the design for a new roller coaster ride. The chief engineer believes the equation of the roller coaster was given by  $(p - p \cos(p), 8 + p \cos(p) - p)$  for  $0 \leq p \leq 2.355\pi$ . The chief engineer wants (a) an accurate graph of the roller coaster, (b) a simplified integral giving the length of the roller coaster and (c) the slope of the ride at  $p = 2\pi$ . Explain why you would or would not ride this roller coaster?

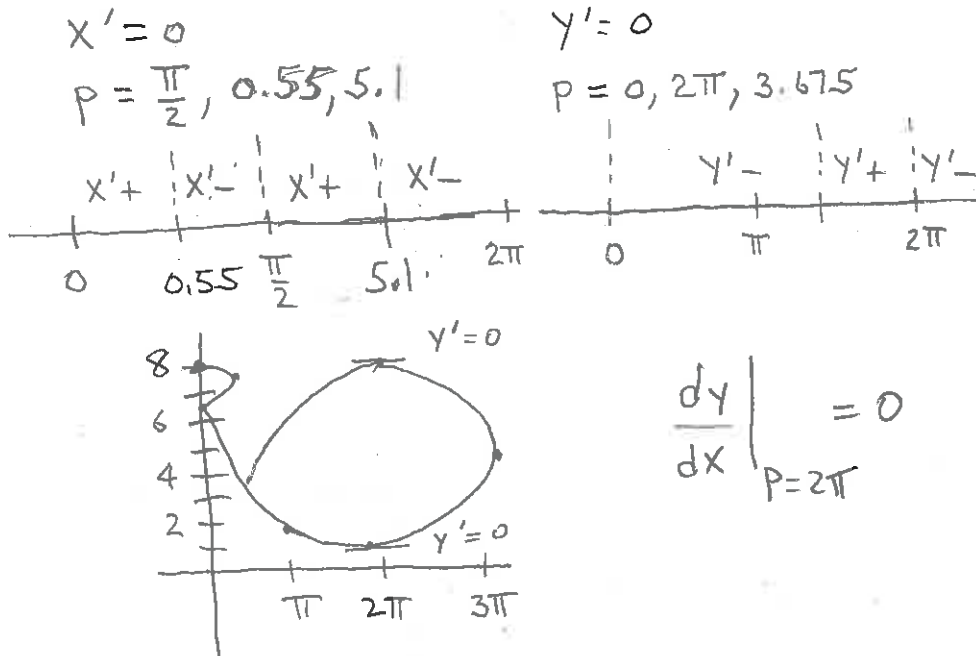
$$x = p - p \sin(p)$$

$$y = 8 + p \cos(p) - p$$

$$x' = 1 - \sin(p) - p \cos(p)$$

$$y' = \cos(p) - p \sin(p) - 1$$

p	x	y
0	0	8
$\frac{\pi}{2}$	0	$8 - \frac{\pi}{2}$
$\pi$	$\pi$	$8 - 2\pi$
$\frac{3\pi}{2}$	$3\pi$	$8 - \frac{3\pi}{2}$
$2\pi$	$2\pi$	8
0.55	.26	7.92
3.675	5.54	1.16
5.1	9.82	4.83



$$\begin{aligned}
 S &= \int_0^{2.355\pi} \sqrt{(1 - \sin(p) - p \cos(p))^2 + (\cos(p) - p \sin(p) - 1)^2} dp \\
 &= \int_0^{2.355\pi} \sqrt{3 + p^2 + 2p(\sin p - \cos p) - 2(\sin p + \cos p)} dp
 \end{aligned}$$