Problem 1. **(1 point)**

Eliminate the parameter in $x = -t^2 + 4t$ and $y = t - 3$ and then identify the parametric curve and sketch its image in the xy-plane on a piece of paper.

Equation: ____________________
Image in the xy-plane:

- Choose
- Circle
- Semicircle opening up
- Semicircle opening down
- Semicircle opening right
- Semicircle opening left
- Ellipse
- Ellipse opening up
- Ellipse opening down
- Ellipse opening right
- Ellipse opening left
- Hyperbola opening up
- Hyperbola opening down
- Hyperbola opening right
- Hyperbola opening left
- Parabola opening up
- Parabola opening down
- Parabola opening right
- Parabola opening left

Problem 2. **(1 point)**

Find the length of the curve defined by the parametric equations

$$x = \frac{5}{3}t, \qquad y = 5\ln((t/3)^2 - 1)$$

from $t = 6$ to $t = 8$.

____

Problem 3. **(1 point)**

Find a Cartesian equation relating x and y corresponding to the parametric equations

$$x = 5\sin(5t) \quad y = 9\cos(5t)$$

Write your answer in the form

$$P(x,y) = 0$$

where $P(x,y)$ is a polynomial in x and y such that the coefficient of y^2 is 25.
Answer: ____________________ $= 0$

Find the equation of the tangent line to the curve at the point corresponding to $t = \pi/15$.
Answer: $y =$ ____________________

Problem 4. **(1 point)**

Consider the curve given by the parametric equations

$$x = t(t^2 - 48), \quad y = 2(t^2 - 48)$$

a.) Determine the point on the curve where the tangent is horizontal.
$t =$___

b.) Determine the points t_1, t_2 where the tangent is vertical and $t_1 < t_2$.

$t_1 =$___
$t_2 =$___

Problem 5. **(1 point)**

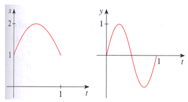
Consider the following parametric equation.

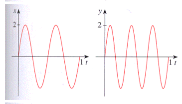
$$x = 15(\cos\theta + \theta\sin\theta)$$
$$y = 15(\sin\theta - \theta\cos\theta)$$

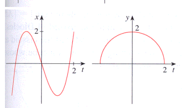
What is the length of the curve for $\theta = 0$ to $\theta = \frac{9}{8}\pi$?
Answer: __________

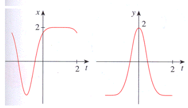
Problem 6. **(1 point)**

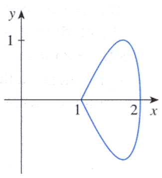
Match the graphs of the parametric equations $x = f(t)$ and $y = g(t)$ in A-D with the parametric curves in 1-4.

A. 

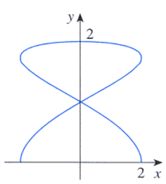
B. 

C. 

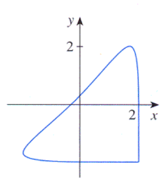
D. 



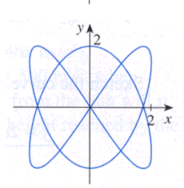
___1.



___2.



___3.

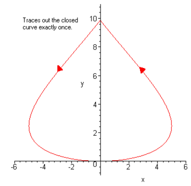


___4.

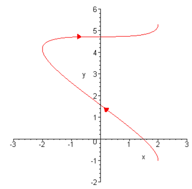
Problem 7. **(1 point)**

Below you are given four parametric equations and their plots. Match each plot to the correct set of parametric equations. (Note: Values along the axes are given in Cartesian coordinates.)

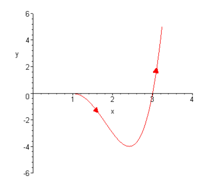
A. $x = 1+\sqrt{t},\ \ y = t^2-4t,\ \ 0 \le t \le 5$
B. $x = 2\cos(t),\ \ y = t-\cos(t),\ \ 0 \le t \le 2\pi$
C. $x = 5\sin(t),\ \ y = t^2,\ \ -\pi \le t \le \pi$
D. $x = e^{-t}+t,\ \ y = e^{t}-t,\ \ -2 \le t \le 2$



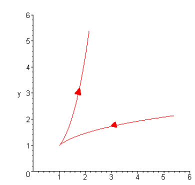
___1.



___2.



___3.



___4.

Problem 8. **(1 point)**

Use the parametric equations of an ellipse

$$x = a\cos(\theta),\ \ y = b\sin(\theta),\ \ 0 \le \theta \le 2\pi,$$

to find the area that it encloses.

Area = ____________

Problem 9. **(1 point)**

Consider the parametric curve given by

$$x = t - e^t, \qquad y = 4t + 4e^{-t}$$

(a) Find dy/dx and d^2y/dx^2 in terms of t.

dy/dx = ____________________

d^2y/dx^2 = ____________________

(b) Using "less than" and "greater than" notation, list the t-interval where the curve is concave upward.

Use upper-case "INF" for positive infinity and upper-case "NINF" for negative infinity. If the curve is never concave upward, type an upper-case "N" in the answer field.

t-interval: ___ $< t <$ ___

Problem 10. **(1 point)**

Which of the following integrals represents the area of the surface obtained by rotating the parametric curve $x = t - t^2$, $y = \frac{4}{3}t^{3/2}$, $1 \le t \le 2$, about the x-axis?

- A. $\int_1^2 2\pi(t-t^2)\sqrt{1-4t+4t^2}\,dt$
- B. $\int_1^2 \frac{8\pi}{3}t^{3/2}\sqrt{1-2t+2t^{1/2}}\,dt$
- C. $\int_1^2 2\pi(t-t^2)\sqrt{1+4t^2}\,dt$
- D. $\int_1^2 \frac{8\pi}{3}t^{3/2}\sqrt{1+4t^2}\,dt$
- E. $\int_1^2 \frac{8\pi}{3}t^{3/2}\sqrt{1-4t+4t^2}\,dt$
- F. $\int_1^2 2\pi(t-t^2)\sqrt{1-2t+2t^{1/2}}\,dt$

Problem 11. **(1 point)**

Find the area of the surface obtained by rotating the curve of parametric equations

$$x = 10\cos^3\theta,\ y = 10\sin^3\theta,\ 0 \le \theta \le \pi/2$$

about the y axis.
Surface area = __________