CALCULUS BC
WORKSHEET ON PARAMETRICS AND CALCULUS

Work these on **notebook paper**. Do not use your calculator.

On problems 1 – 5, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

1. $x = t^2,\ y = t^2 + 6t + 5$
2. $x = t^2 + 1,\ y = 2t^3 - t^2$
3. $x = \sqrt{t},\ y = 3t^2 + 2t$
4. $x = \ln t,\ y = t^2 + t$
5. $x = 3\sin t + 2,\ y = 4\cos t - 1$

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6. A curve C is defined by the parametric equations $x = t^2 + t - 1,\ y = t^3 - t^2$.

   (a) Find $\frac{dy}{dx}$ in terms of t.

   (b) Find an equation of the tangent line to C at the point where $t = 2$.

7. A curve C is defined by the parametric equations $x = 2\cos t,\ y = 3\sin t$.

   (a) Find $\frac{dy}{dx}$ in terms of t.

   (b) Find an equation of the tangent line to C at the point where $t = \frac{\pi}{4}$.

On problems 8 – 10, find:

(a) $\frac{dy}{dx}$ in terms of t.

(b) all points of horizontal and vertical tangency

8. $x = t + 5,\ y = t^2 - 4t$
9. $x = t^2 - t + 1,\ y = t^3 - 3t$
10. $x = 3 + 2\cos t,\ y = -1 + 4\sin t$

On problems 11 - 12, a curve C is defined by the parametric equations given. For each problem, write an integral expression that represents the length of the arc of the curve over the given interval.

11. $x = t^2,\ y = t^3,\ 0 \le t \le 2$
12. $x = e^{2t} + 1,\ y = 3t - 1,\ -2 \le t \le 2$