Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

### Tangents with Parametric Equations

For problems 1 – 3 compute \( \frac{dy}{dx} \) and \( \frac{d^2y}{dx^2} \) for the given set of parametric equations.

1. \( x = 7t^2 - 9t \quad y = t^6 + 2t^2 \)
2. \( x = \tan(2t) - 12 \quad y = 3\sin(2t) + \sec(2t) + 4t \)
3. \( x = \ln(3t^2) + 8t \quad y = \ln(t^4) - 6\ln(t^2) \)

For problems 4 – 7 find the equation of the tangent line(s) to the given set of parametric equations at the given point.

4. \( x = t^3 + \cos(\pi t) \quad y = 4t + \sin(2t + 6) \) at \( t = -3 \)
5. \( x = t^3 + 2t - 1 \quad y = t^3 + 7t^2 + 8t \) at \( t = 1 \)
6. \( x = 6 - e^{t^3} \quad y = t^3 + 3t^2 - 18t + 2 \) at \( (5, 2) \)
7. \( x = 6\sin\left(\frac{\pi}{2}t\right) \quad y = t^2 + 2t - 8 \) at \( (-6, 7) \)

For problems 8 and 9 find the values of \( t \) that will have horizontal or vertical tangent lines for the given set of parametric equations.

8. \( x = t^3 - 5t^2 + t + 1 \quad y = t^4 + 8t^3 + 3t^2 \)
9. \( x = 7t^2 + e^{2t^2} \quad y = 10\sin\left(\frac{1}{2}t\right) - 1 \)