Particle Motion WS
AP Calculus AB

A Graphing Calculator is required for some problems or parts of problems.

1. Find the velocity and acceleration of a particle whose position function is $x(t) = \sin(2t) + \cos(t)$.
2. If the position of a particle is $x(t) = \sin\left(\frac{t}{2}\right)$, $0 < t < 4\pi$, find when the particle is changing direction.
3. If the position of a particle is $s(t) = t^2 + 8t$, $t > 0$, find the distance the particle travels from $t = 0$ to $t = 4$.
4. If the position function of a particle is $s(t) = \sin^2(2t)$, $t > 0$, find the distance that the particle travels from $t = 0$ to $t = 2$.
5. If the position of a particle is $x(t) = 2t^3 - 21t^2 + 60t + 3$, $t > 0$, find the interval(s) of time during which the particle is speeding up.

Mixed Review:

6. Find the point(s) on the curve $y = \frac{x^4}{2} - 54x$ where the tangent is parallel to the x-axis.
7. The sides of an equilateral triangle are increasing at the rate of 27 in/sec. How fast is the triangle's area increasing when the sides of the triangle are each 18 inches long? $\left(A = \frac{s^2\sqrt{3}}{4}\right)$
8. Find $\lim_{h\to 0} \frac{(3+h)^2 - 9}{h}$ and $\lim_{h\to 0} \frac{\sin(x+h) - \sin x}{h}$.
9. Find the equation for the tangent to $y = 2xe^{x^2}$ @ $x = 1$.
10. Without using the graph, find the interval(s) where $f(x) = \frac{2x^3}{3} - \frac{3x^2}{2} - x + 10$ is increasing.