PreCalc BC **7- Second Derivs and Accel** **Name:**

1. Let $f(x) = x^3 - 9x^2 + 24x$.

a) Find the roots of $f(x)$
b) Write an expression for $f'(x)$
c) Find the equation of the tangent at $x = 1$
d) Write the equation of the perpendicular to the tangent at the origin
e) When is the slope equal to zero? Write equations for the horizontal tangents.
f) What is the second derivative of $f(x)$?
g) When is the second derivative equal to zero?
h) What does this correspond to in the original graph? (Use your calculator!)
i) Can you think of a function whose derivative is $f(x)$?

2. USE YOUR CALCULATOR and your knowledge of derivatives

Let the position of a particle be given by s(t) = $t^4 - 8t^3 + 19t^2 - 12t$, for $t \geq 0$
a) When does the particle return to its starting point?
b) When does the particle's velocity equal zero? What is the particle's position at these times?
c) When is the particle's acceleration equal to zero? What is the velocity at these times?

3. Find the first and second derivatives of the functions below

a) y = 5sin(x) b) y = $-e^x$ c) y = $\sqrt[3]{x}$ d) y = x - 1/x e) y = ln$x$ + x

4. For each of the functions below evaluate the indicated derivative analytically

a) $f(x) = 1/x$ b) $g(x) = \sin(x)$ c) $h(x) = \ln(x)$ d) $k(x) = x^6$

$f'''(2)$ = $g^{iv}(\pi/3)$ = $h''(1)$ $k^{vi}(1)$ =

5. Shown at right is a time-*velocity* graph.
Put an (*a)* by any point where the object is at rest.
Put a *(b)* by any point where the velocity is a maximum.
Put a *(c)* by any point where the acceleration is zero
Put a *(d)* by the point where the object is furthest from its starting point.