Name:_____

1) Differentiate the following functions: (2 Points Each)

A) $f(x) = \dfrac{x^3 + 4x^2 + 3}{\sqrt{x}}$

B) $y(t) = ae^t + \dfrac{b}{t} + \dfrac{c}{t^2}$

C) $V(t) = \sqrt[3]{t^2} + 2\sqrt{t^3}$

2) If $f(x) = -2e^x g(x)$

$g(0) = -5$ and $g'(0) = 3$, find $f'(0)$

.

3) Differentiate the following function: $f(x) = \dfrac{ax^2 - b}{cx^3 - d}$ (2 Points)

4) **Algebraically**

On what interval is the function $f(x) = x^3 - 4x^2 + 5x$ concave upward?

(3 Points) (Hint: for Concavity, we check out the second derivative, and …….)

5) **Algebraically**

On what interval is the function $f(x) = x^5 e^x$ increasing?   (2 Points)

6) The position of a particle is given by the equation $S = f(t) = t^3 - 6t^2 + 9t$

Where t is measured in seconds and S is measured in meters.   (5 Points)

   a) **Algebraically**, when is the particle at rest?

   b) Find the distance traveled by the particle during the first five seconds.

   c) Graph the position, velocity, and acceleration functions for $0 \leq t \leq 5$

   d) When is the particle speeding up?

   e) When is the particle moving forward?