Differentials and Particle Motion

1. Find the general solution for:

    a. $y' = \sqrt{x} + \sqrt[3]{x}$ b. $y' = 3x^2 + 2x - 7$

2. Find the particular solution for $f'(x) = 3\cos x + 5\sin x$ when f(0)=4

3. Find the particular solution for $f''(x) = x$ $f(0) = -3$ $f'(0) = 2$

4. A stone is thrown vertically upward from the ground with an initial velocity of 20 ft/s. a) How long will it take the stone to strike the ground? b) With what velocity will the stone strike the ground? c) How long will the stone be going upward? d) How high will the stone go?

5. A ball is dropped from the top of the Washington Monument, which is 555 feet high. A) How long will it take the ball to reach the ground? b) With what velocity will it strike the ground?

6. A stone is thrown vertically upward from the top of a house 18 feet above the ground with an initial velocity of 32 ft/s. a) Give the equation for velocity in terms of t. b) Give the equation for position in terms of t. c) At what time will the stone reach its greatest height? d) How long will it take the stone to strike the ground? e) With what velocity will it strike the ground?

7. **97:1** A particle moves along the x-axis so that its velocity at any time t ≥ 0 is given by v (t) = $3t^2$-2t-1. The position x (t) is 5 for t = 2. a) Write a polynomial expression for the position of the particle at any time t ≥ 0. b) For what values of t, 0 ≤ t ≤ 3, is the particles instantaneous velocity the same as its average velocity on the closed interval [0,3]? C) Find the total distance traveled by the particle from t= 0 until t = 3.