HIGHER ORDER DERIVATIVES

1. Find the first and second order derivatives of the given function.

a) $f(x) = x^4 - 2x^3 + 4x^2 - 6$

b) $f(x) = x^{10} + 4x^7 - 2x^3 + 2x$

c) $f(x) = \sqrt{x^2 + 1}$

d) $f(x) = \sqrt[3]{x} + \sqrt{x}$

e) $f(x) = (3x + 2)^3$

f) $f(x) = \ln (3x+4)^3$

g) $f(x) = e^{(5x + 3)}$

h) $f(x) = (4x + 1)^{3/4}$

2. Find the third derivative of the given function.

a) $f(x) = \sqrt{5x - 1}$

b) $f(x) = \dfrac{1 - x}{1 + x}$

c) $f(x) = \dfrac{5}{(1 + x^2)}$

3. If $f(x) = (2 - 3x)^{(-1/2)}$, find f(0), f'(0), f''(0), and f'''(0)

4. If $f(x) = (2 - t^2)^6$, find f(0), f'(0), f''(0), and f'''(0)

5. Find a second-degree polynomial "f" such that f(2) = 5, f'(2) = 3, and f'''(2) = 2

6. Find a third-degree polynomial "f" such that f(1) = 1, f'(1) = 3, f''(1) = 6, and f'''(1) = 12.

7. Note: the first derivative represents the velocity of an object as a function of time.
: the second derivative represents the instantaneous rate of change of velocity with respect to time (acceleration)

Each equation represents the motion of a given particle with distance in meters and time in seconds. Find (a) the velocity and acceleration as a function of time, b) the acceleration after 1 sec, and c) the acceleration at the instants when the velocity is 0.

a) $s = t^3 - 3t$
b) $s = t^2 - t + 1$
c) $s = 2t^3 - 7t^2 + 4t + 1$