MATH 220: CALCULUS I
WORKSHEET 16
MARCH 14, 2013

Homework: Read section 4.9; do problems 1–17, 20–22, 25–33, 41–43, 65 69, and 73–75.

1. Find the most general antiderivative of each of the following functions.

   (a) $f(x) = 1/x$ $F(x) = \ln(x) + C$ (for $x>0$, otherwise $\ln|x| + C$ is required)

   (b) $f(x) = x^n$, $n \neq -1$ $F(x) = \frac{1}{n+1}x^{n+1} + C$

   (c) $f(x) = 2e^3$ $F(x) = 2e^3 x + C$

2. Find f

   (a) $f''(x) = 5x^2 + 2$

   $f'(x) = \frac{5}{3}x^3 + 2x + C$

   $f(x) = \frac{5}{12}x^4 + x^2 + Cx + D$

   (b) $f'''(x) = \sin(x) - \cos(x)$

   $f''(x) = -\cos(x) - \sin(x) + C$

   $f'(x) = -\sin(x) + \cos(x) + Cx + D$

   $f(x) = \cos(x) + \sin(x) + \frac{C}{2}x^2 + Dx + E$

3. Suppose I throw a rock straight up into the air with an initial velocity of v_0, from a height of y_0, and where the accelleration due to gravity is a_0 (negative). Find an equation for the height of the rock at time t using that $v'(t) = a(t) = a_0$. (i.e. the derivative of the velocity is the accelleration at time t, which is always a_0.)

this doesn't show up in this problem. I mention it so you will be used to seeing a_0 being negative.

Accelleration: $a(t) = a_0$ (constant)

find velocity by taking antiderivative of $a(t)$: $v(t) = a_0 t + C$

v_0 is initial velocity, that is, $v(0) = v_0$, so $v(0) = v_0 = a_0 \cdot 0 + C$, so $C = v_0 \longrightarrow v(t) = a_0 t + v_0$

find height $y(t)$ by taking antiderivative of $v(t)$: $y(t) = \frac{1}{2}a_0 t^2 + v_0 t + D$

Again, since $y_0 = y(0)$, we get $D = y_0$, so $y(t) = \frac{1}{2}a_0 t^2 + v_0 t + y_0$