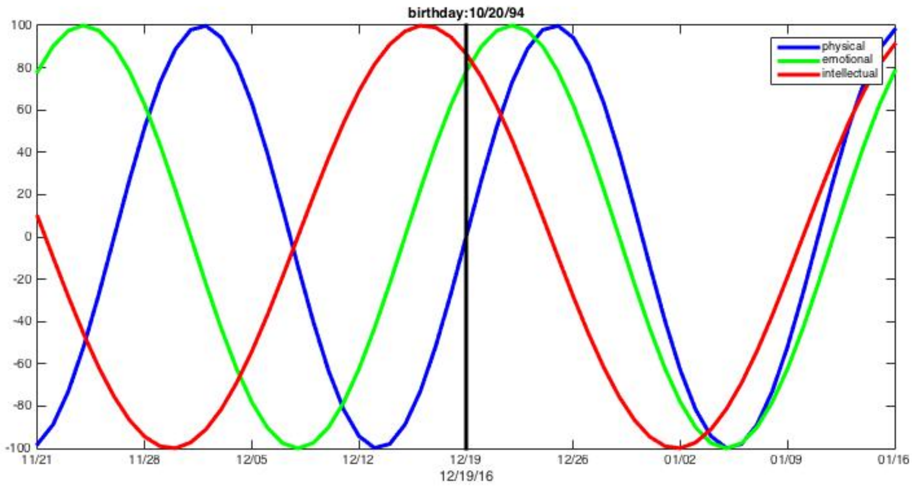
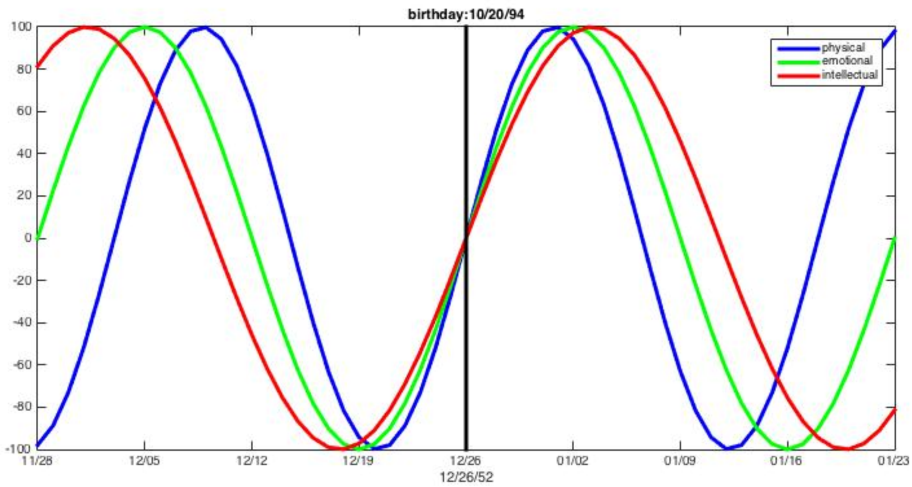
HW8 M3

Answer (for reference only)

1.



2.



It takes 23*28*33 = 21252 days to return to the initial condition. I figure out that the first occurrence must happen 58 years after my birth, on Dec 26, 2052.

Code:

```
%% Q1
birthday = datenum('10/20/1994');
t1 = fix(now);
TA_hw8_function(birthday, t1);
%% Q2
cycle = lcm(lcm(23,28),33);
t1 = birthday + cycle;
TA_hw8_function(birthday, t1);
```

```
function TA_hw8_function( birthday, t1 )
    PlotBiorhythms(birthday, t1)
end
function PlotBiorhythms( birthday, t1 )
starting_day = t1 - 28;
ending_day = t1 + 28;
x = starting_day:1:ending_day;
physical = 100 * sin(2*pi*(x - birthday)/23);
emtional = 100 * sin(2*pi*(x - birthday)/28);
intellectual = 100 * sin(2*pi*(x - birthday)/33);
scrsz = get(groot, 'ScreenSize');
figure('Position', [1 scrsz(4)/2 scrsz(3)*2/3 scrsz(4)/2]);
p = plot(x, physical, 'b', x, emtional, 'g', x, intellectual, 'r');

line([t1 t1], [-100 100], 'LineWidth', 3, 'Color', 'k');
set(p, 'LineWidth', 3);
xlim([starting_day ending_day]);
set(gca, 'xTick', x(1):7:x(end));
datetick('x', 'mm/dd', 'keeplimits', 'keepticks');
title(strcat('birthday: ', datestr(birthday, 'mm/dd/yy')))
xlabel(datestr(t1, 'mm/dd/yy'));
legend('physical', 'emotional', 'intellectual');
end
```

3.

Both impossible.

When we want to find the exactly maximum value, we first find the cycle of these three functions: 23t + $\frac{1}{4}\times 23$, 28t + $\frac{1}{4}\times 28$, 33t + $\frac{1}{4}\times 33$.

And we want to solve this equation: 23t + $\frac{1}{4}\times 23$ = 28t + $\frac{1}{4}\times 28$ = 33t + $\frac{1}{4}\times 33$.

We can simplify to this one: 23*4t + 23 = 28*4t + 28 = 33*4t + 33

➔ 23(1+4t) = 28(1+4t) = 33(1+4t)

➔ 23*28*33*tmp = 28*23*33*tmp = 33*28*23*tmp

➔ (1+4t) = 28 * 33 * tmp = 23 * 33 * tmp = 28 * 23 * tmp

➔ We get t = (28 * 33 * tmp)/4 - $\frac{1}{4}$. While we want to get the "exact time", the t value would never be an integer for this equation. It's **impossible** to find the time.

For the minimum value, we have the cycle of these three functions: 23t + $\frac{3}{4}\times 23$, 28t + $\frac{3}{4}\times 28$, 33t + $\frac{3}{4}\times 33$.

➔ 23t + $\frac{3}{4}\times 23$ = 28t + $\frac{3}{4}\times 28$ = 33t + $\frac{3}{4}\times 33$

➔ 23*4t + 3*23 = 28*4t + 3*28 = 33*4t + 3*33

➔ 23(3+4t) = 28(3+4t) = 33(3+4t)

➔ 23*28*33*tmp = 28*23*33*tmp = 33*28*23*tmp

➔ (3+4t) = 28 * 33 * tmp = 23 * 33 * tmp = 28 * 23 * tmp

➔ t = (28 * 33 * tmp)/4 - $\frac{3}{4}$. While we want to get the "exact time", the t value would never be an integer for this equation. It's **impossible** to find the time.