Our goal for this week is to finish covering the material for the AP examination. There are two topics, both of which are covered in Thomas §9.1. These topics are:

- Slope fields

- Separable differential equations

Recall that a differential equation is an equation that involves an independent variable x, a functions y, and the derivatives of y of various orders, namely y', y'', y''', and so forth.

The *order* of a differential equation is the highest order of a derivative of y that appears in the equation. For example, $\dfrac{dy}{dx} + y = \dfrac{x^3}{8} - 2x$ is a first order differential equation, $\dfrac{d^2y}{dx^2} - ye^x = \cos x$ is a second order differential equation.

Consider the second order differential equation $y'' + y = 0$. It can be shown that the general solution is $y = a\sin x + b\cos x$.

Slope fields are an interesting aspect of first order differential equations. This is because, for every ordered pair (a, b), we can plug in $x = a$ and $y = b$ and solve for $\dfrac{dy}{dx}$. This will tell us the slope of any solution at a given point.

For example, consider the equation $\dfrac{dy}{dx} + y = \dfrac{x^3}{8} - 2x$. We can solve if for y' and arrive at

$$y'(x, y) = \frac{x^3}{8} - 2x - y.$$

The slope of y at $(0, 0)$ is $y'(0, 0) = 0$, at $(2, 3)$ is is $y'(2, 3) = 1 - 4 - 3 = -6$, and so forth. If we do this at every point, we get a real number which represents slope at every point in the plane. This is called a *slope field*.

We can draw a picture of a slope field by drawing a small, tilted line segment at a collection of points in the plane. The slope of the small line segment is the value of $y'(x, y)$. This is a detailed picture of the slope field for $\dfrac{dy}{dx} + y = \dfrac{x^3}{8} - 2x$.
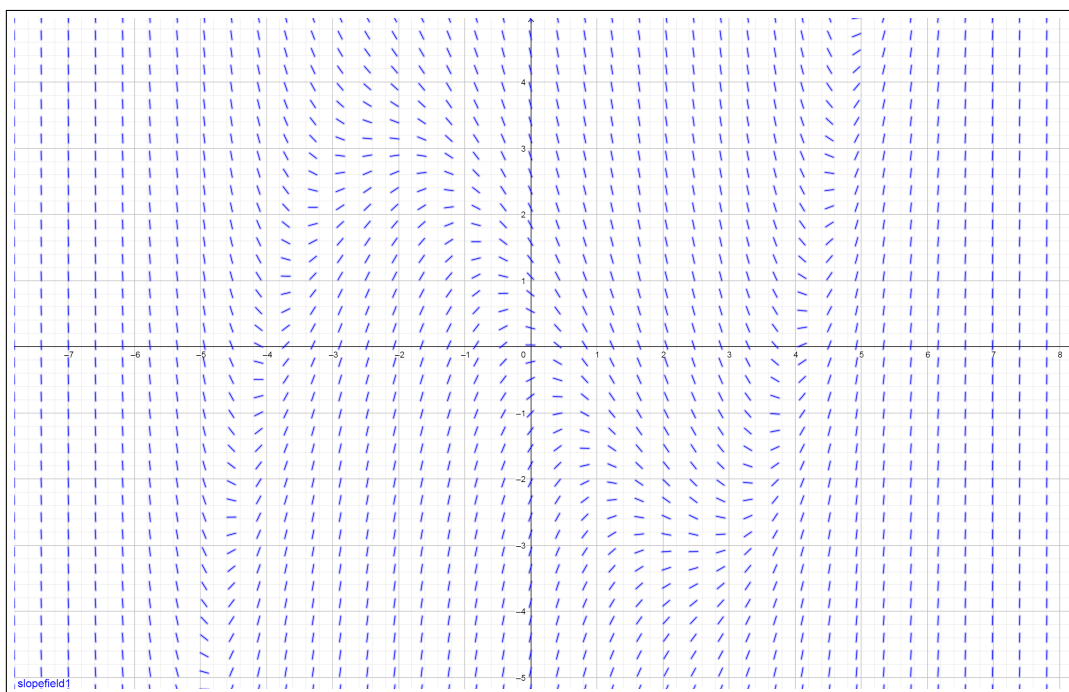
Your assignment for today is:

- Read Thomas §9.1 pages 642 - 646 up to Example 3 on separable equations.

- Watch the following video:

<div align="center">Kahn Academy Slope Fields</div>

- Why Viruses Spread Exponentially

After your have done this, please acknowledge that by filling out the following Google Forms checkin.

<div align="center">0330 AP Calculus AB Checkin</div>

I will respond to your questions and work out Friday's solutions soon.

We will have a Microsoft Teams meeting Monday at 9 AM. I will send an invite on the General channel chat. The purpose of the meeting is to discuss how to proceed going forward. Please attend if you are interested.