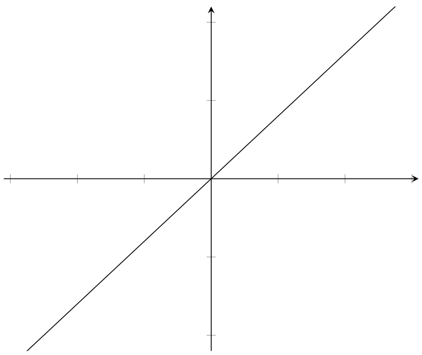
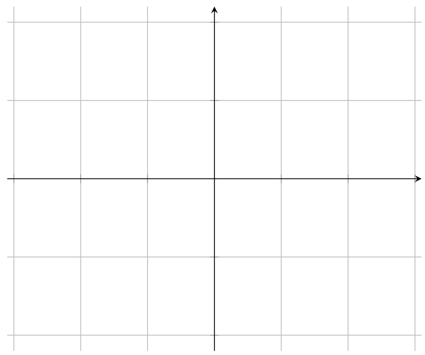
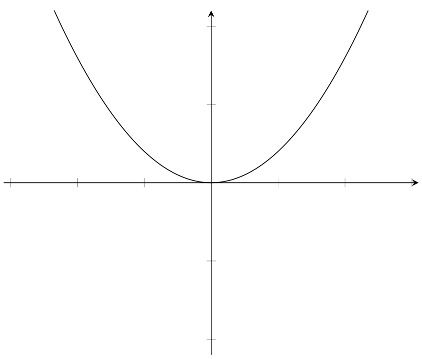
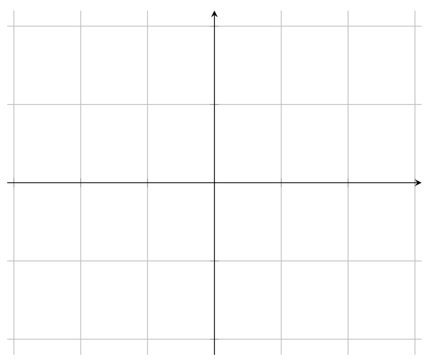
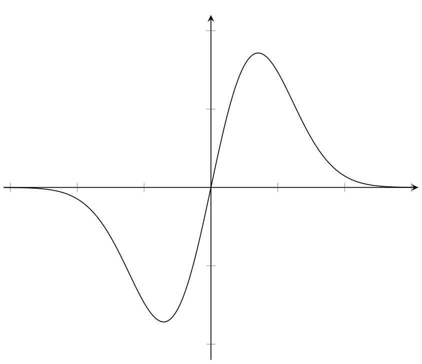
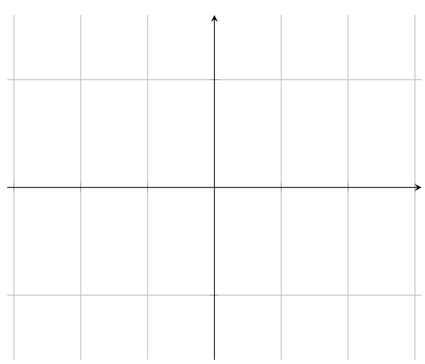
Math 1110: **Anti-Derivatives** Nov 9 (Fri)

## 1. Graphs of Antiderivatives

For each of the following functions $g$, sketch a function $f$ on the right such that $f' = g$.

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Adapted from work by S. Bennoun, M. Hin, and T. Holm ©

## 2. Some theory on antiderivatives.

In what way is the antiderivative a kind of "inverse" for derivatives? (Skip this question if you're working ahead.)

If $f_0$ and $f_1$ are both antiderivatives of $g$, how different can $f_0$ and $f_1$ be?

## 3. Antiderivatives of functions.

Write down the antiderivatives of:

| | | | |
|---|---|---|---|
| $x^a,\ a \neq -1$ | | $f' + g'$ | |
| $x^{-1}$ | | $f' \cdot g + f \cdot g'$ | |
| $e^x$ | | $-\frac{f'}{f^2}$ | |
| $\cos(x)$ | | $\frac{f'}{f}$ | |
| $\sec^2(x)$ | | $2 \cdot f \cdot f'$ | |
| $\frac{1}{\sqrt{1-x^2}}$ | | $a^x,\ a > 0$ | |

## 4. Specific antiderivatives.

If we specify the value that the antiderivative must take at a single point, then we can get a *unique* antiderivative. For each of the following parts, find the unique function $f$ such that:

(a) $f'(x) = x^2$ and $f(0) = 1$.

(b) $f'(x) = \dfrac{2}{\sqrt{1-4x^2}}$ and $f(1/2) = \pi$.

(c) $f''(x) = 2 + \cos(x)$, $f'(0) = 2$, and $f(0) = 3$.