Remember:

- **The IVT:** Let f be a continuous function on $[a, b]$ and let y be between $f(a)$ and $f(b)$. Then there exists a number c between $x = a$ and $x = b$ such that $f(c) = y$.
- **The MVT:** Let f be a differentiable function on $[a, b]$ Then there exists a number c between $x = a$ and $x = b$ such that

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

1. Draw the graph of a function f where f does **not** satisfy the *conclusion* of the IVT on the interval $[-1, 1]$. What is the value of y where the IVT fails?

2. Draw the graph of a function f where f does **not** satisfy the *hypotheses* of the IVT on the interval $[-1, 1]$, but **does** satisfy the conclusion of the IVT on $[-1, 1]$.

3. Draw the graph of a function f where f does **not** satisfy the *conclusion* of the MVT on the interval $[-1, 1]$.

4. Draw the graph of a function f where f does **not** satisfy the *hypotheses* of the MVT on the interval $[-1, 1]$, but **does** satisfy the conclusion of the MVT on $[-1, 1]$.

Using only what we know so far – that the integral is the *signed* area between the graph and the x-axis, evaluate the following integrals.

1. $\int_0^4 2x\ dx$
2. $\int_{-1}^0 2x\ dx$
3. $\int_{-1}^4 2x\ dx$
4. $\int_{-1}^1 x^3\ dx$
5. $\int_0^\pi \cos(x)\ dx$
6. $\int_2^0 x+2\ dx$