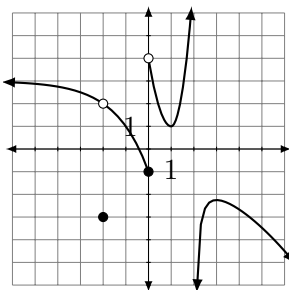


Show all work.

1. (4 points) Find a value for the parameter  $p$  such that the function  $f(x) = \begin{cases} 2^x & \text{if } x \leq 3 \\ px + 4 & \text{if } x > 3 \end{cases}$  is continuous everywhere.

2. (5 points) Prove that  $\lim_{t \rightarrow 6} -5 - 2t = -21$  using epsilon-delta methods.

3. (6 points) Below is the graph of a function  $f(x)$ . For each of the six quantities listed, give its value if it has a value, or specifically state that it does not exist.



$$\lim_{x \rightarrow 2^-} f(x)$$

$$\lim_{x \rightarrow 0} f(x)$$

$$\lim_{x \rightarrow 1^+} f(x)$$

$$\lim_{x \rightarrow -\infty} f(x)$$

$$\lim_{x \rightarrow -2} f(x)$$

$$f(0)$$

4. (5 points) Calculate the value of  $\lim_{x \rightarrow \infty} \frac{x^4 \arctan x - 5x^3}{1 - 6x^2 - 4x^4}$ , or explicitly indicate that it does not exist.

5. (2 point bonus) Prove (on the back) that the equation  $x = \tan x$  has infinitely many solutions.