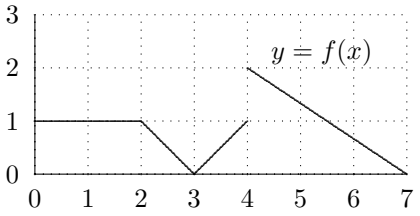
Math 180 sample problems for Hour Exam One

1. What is the slope of the linear function $f(x)$ whose graph goes through the points $(1, 2)$ and $(4, 4)$? What is the value of $f(7)$?
2. Find $\lim_{x \to 2} \dfrac{x^2 - 3x + 2}{x^2 - x - 2}$.
3. The graph of function $f(x)$ is below. At what point or points is $f(x)$ not continuous?



4. Find the derivatives of the following functions using the basic rules. Do not simplify your answer.

$$\text{(a) } x^3 + x^{1/3}, \qquad \text{(b) } x^2 e^x, \qquad \text{(c) } \frac{2 + x}{3 + x^2}.$$

5. Find the derivatives of the following functions using the basic rules. Do not simplify your answer.

$$\text{(a) } 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3, \qquad \text{(b) } (x - 1)e^x, \qquad \text{(c) } \frac{1}{\sqrt{x} - 1}.$$

6. Find the equation of the tangent line to $y = f(x)$ at $x = 2$ for the function $f(x) = -x^2 + 7x$. Do not simplify your answer.
7. Let $f(x) = x^2 + 3$.
   (a) Find the average rate of change of $f(x)$ over the interval $1 \leq x \leq 3$.
   (b) Find the instantaneous rate of change of $f(x)$ at $x = 2$.
8. Let $f(x) = x^2$. Use the definition of the derivative as the limit of the difference quotient to find $f'(3)$.
9. Use the table below, which shows values of $f(x)$ for x near 2,

x	1.8	1.9	2.0	2.1	2.2
$f(x)$	2.24	2.27	2.30	2.33	2.37

   to find the slope of a secant line that is an estimate for $f'(2)$.
10. Find $\lim_{x \to 1} \dfrac{\sqrt{3x + 1} - \sqrt{2x + 2}}{x - 1}$.