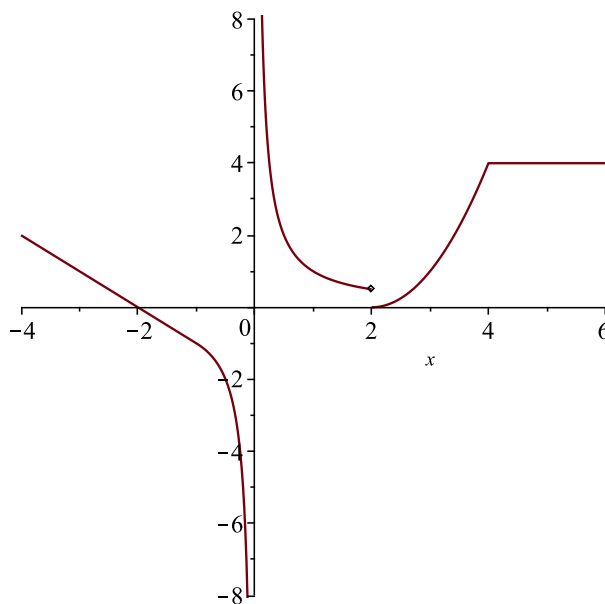# 25 Sep Recitation Worksheet for MA141

1. Let $f(x)$ be defined as

$$f(x) = \begin{cases} -x - 2 & x \leq -1 \\ 1/x & -1 < x \leq 2 \\ (x-2)^2 & 2 < x \leq 4 \\ 4 & x > 4 \end{cases}.$$

Use interval notation to describe the following sets:

   (a) The domain of f

   (b) Where f is continuous

   (c) Where f is differentiable

   (d) Is f continuous over its domain?

2. Using the definition of derivative, show what the derivative of the following functions are:

   (a) $g(x) = 2x^2 + 5x$

   (b) $h(x) = \frac{1}{x}$

   (c) $f(t) = \frac{t}{t+1}$

3. Find the derivative of the following functions:

   (a) $a(x) = 14x^{10} - 10x^{14}$

   (b) $f(x) = \frac{5}{x} + 5x - \frac{1}{x^3}$

   (c) $b(x) = 4x^{7/5} + 3x^{3/4}$

   (d) $w(x) = 11x^4 - 7x^2 + x - 1$

   (e) $w'(x)$

   (f) $w''(x)$

   (g) $w^{(100)}(x)$

4. An object is dropped off a 50 meter building and its height (in meters) can be modeled by the equation $s(t) = 50 - 0.005t^2$ where t is measured in seconds.

   (a) When does the object hit the ground?

   (b) What is the velocity of the object after 1 second?

   (c) What is the velocity of the object when it hits the ground?

5. A ball is thrown straight up and its height in meters after t seconds can be modeled with the equation $s(t) = 7t - t^2$.

   (a) When does the ball hit the ground?

   (b) How long does it take for the ball to start falling back down?

   (c) What is the maximum height the ball attains?

   (d) What is the velocity of the ball as it hits the ground?