



Cal I (S) (Maths 201–NYA)

Answers

NYA Cal I — Quiz 5

1.  $f$  is continuous at  $x = 3$ , discontinuous (but continuous from the left) at  $x = 5$ .
2.  $g$  is continuous if (and only if)  $b = 1 - 2a$ .
3. At points  $a, c$ ,  $f$  is continuous and differentiable. At point  $b$ ,  $f$  is continuous, but not differentiable. At points  $d, e$ ,  $f$  is neither continuous nor differentiable.
4.  $f$  has removable discontinuities at  $x = 0, -\frac{1}{2}$  (it has a non-removable discontinuity, in fact a vertical asymptote, at  $x = \frac{1}{2}$  as well). A function  $g(x)$  which is the same as  $f$  for all other points, but is continuous at  $x = 0, -\frac{1}{2}$ , is the following:

$$g(x) = \frac{x-1}{2x-1} \quad ; \text{ this may equivalently be expressed as } g(x) = \begin{cases} \frac{2x^3-x^2-x}{4x^3-x} & \text{if } x \neq 0, -\frac{1}{2}, \frac{1}{2} \\ 1 & \text{if } x = 0 \\ \frac{3}{4} & \text{if } x = -\frac{1}{2} \end{cases}$$

5. (a) can be any continuous graph with an “abrupt” change in direction at  $x = 0$ ; (b) is impossible (differentiable implies continuous); (c) can be any otherwise continuous graph with a “hole” at  $x = 0$ .