TMATH 124: Quiz 2

Key

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work. No calculators or notes are allowed.

1. [4] (Day 3 & 4) Draw a function g such all three conditions below are met:

+1

(a) $\lim_{x \to -\infty} g(x) = 1$

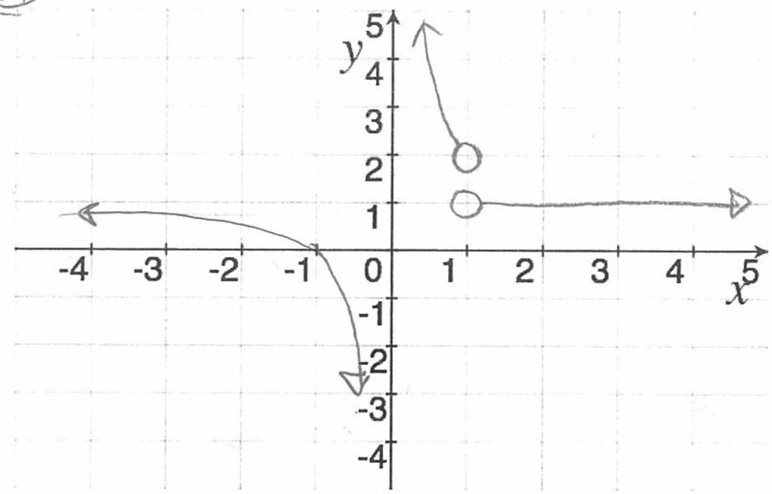
+1

(b) g is *not* continuous at $x = 1$.

+1

(c) $g'(3) = 0$

+1



note: there are many correct answers

2. [3] Find a rule for the function g you drew above that satisfies the ~~four~~ three conditions.

$$g(x) = \begin{cases} \frac{1}{x} + 1 & \text{if } x < 1 \\ 1 & \text{if } 1 < x \end{cases}$$

matches +1

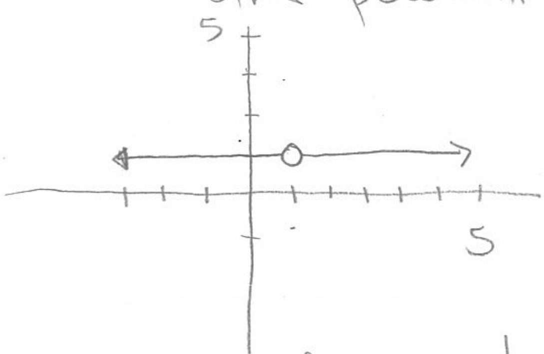
(a) +.5

(b) +.5

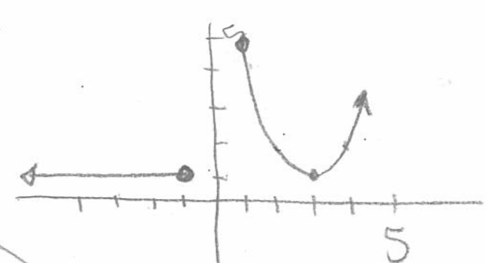
(c) +.5

function +.5

other possibilities:



$$g(x) = \begin{cases} 1 & \text{if } x < 1 \\ 1 & \text{if } 1 < x \end{cases} \quad \text{or} \quad g(x) = \frac{x-1}{x-1}$$



$$g(x) = \begin{cases} 1 & \text{if } x \leq -1 \\ (x-3)^2 + 1 & \text{if } 1 \leq x \end{cases}$$

3. (WebHW5 #5) [3] Find the equation of the line tangent to $f(x) = 6 + 4x^2$ when $x = 1$

(+.5) Looking for $y = mx + b$

m = slope of the line tangent to f at $x=1$

$= f'(1)$

$= 8$

(+1)
$$= \lim_{h\to 0} \frac{f(1+h)-f(1)}{h} = \lim_{h\to 0} \frac{6+4(1+h)^2-(6+4(1)^2)}{h}$$

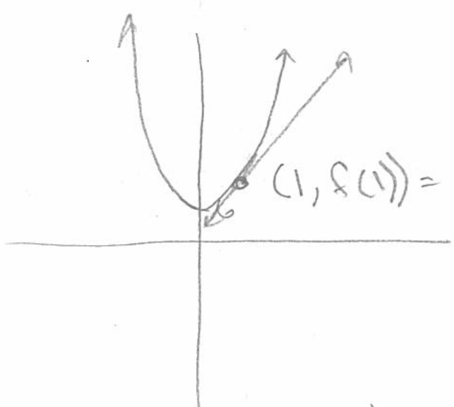
$$= \lim_{h\to 0} \frac{\cancel{6}+\cancel{4}+8h+4h^2-\cancel{10}}{h} = \lim_{h\to 0} \frac{\cancel{h}(8+4h)}{\cancel{h}}$$

$$= \lim_{h\to 0} 8+4h = 8+4(0) = 8$$

or

(+.5)
$$f'(x) = [6+4x^2]' = [6]' + [4x^2]'$$
$$= 0 + 4[x^2]' = 4\cdot 2x^{2-1} = 8x$$

(+.5) since we want $f'(1) = 8(1) = 8$



$(1, f(1)) = (1, 6+4(1)^2) = (1, 10)$ } (+.5)

Since $(1, 10)$ is on the line

$y - 10 = 8(x-1)$ or

$10 = 8(1) + b$

$\Rightarrow 10 = 8 + b$

$-8 \quad -8$

$2 = b$

So

$y = 8x + 2$

* note: graph not drawn to scale *

plug in point (+.5)

notation (+.5)