Name_____ Section_____

For each of the following two functions (questions #1 and #2) *(1 point for each part)*:

a) On the provided graph paper, sketch a graph of the function making sure to indicate any discontinuities using open circles and/or vertical asymptotes.

b) State the value of $x$ for any discontinuities in the function.

c) For each discontinuity, identify whether it is a **removable** discontinuity, a **jump** discontinuity, or a **vertical asymptote**.

d) Determine the value of the limit of the function at each discontinuity. (i.e. Find $\lim_{x\to d} f(x)$ where the discontinuity occurs at $x = d$ .)

If the limit is not defined at the discontinuity, write *undefined*.

1) $f(x) = \dfrac{x^3 - 8}{x - 2}$

b) discontinuous at $x = 2$ since $f(2) = \dfrac{2^3 - 8}{2 - 2} = \dfrac{0}{0} = \textit{undefined}$

c) removable

d) $\lim_{x\to 2} \dfrac{x^3 - 8}{x - 2} = \lim_{x\to 2} \dfrac{(x-2)(x^2 + 2x + 4)}{x - 2} = \lim_{x\to 2} (x^2 + 2x + 4) = 2^2 + 2 \cdot 2 + 4 = 12$

2) $f(x) = \dfrac{|x+1|}{x+1}$

b) discontinuous at $x = -1$ since $f(-1) = \dfrac{|-1+1|}{-1+1} = \dfrac{0}{0} = \textit{undefined}$

c) jump

d) *undefined* since $\lim_{x\to -1^-} \dfrac{|x+1|}{x+1} = -1 \neq 1 = \lim_{x\to -1^+} \dfrac{|x+1|}{x+1}$

3) Given the function: $f(x) = x^3$

a) Find $f'(x)$ *(1 point)*:

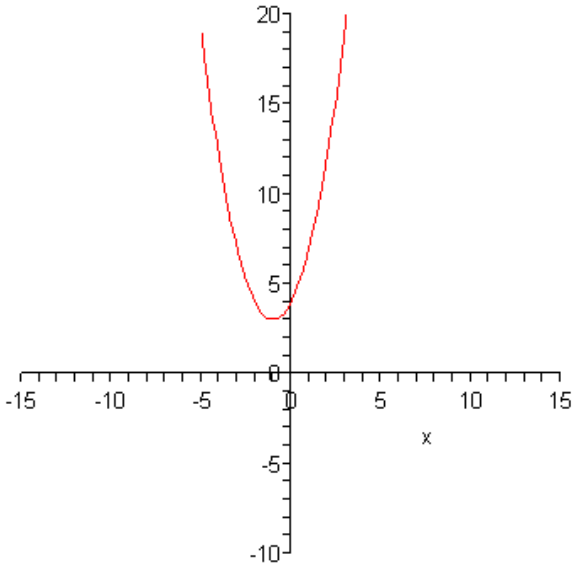
$f'(x) = 3 \cdot x^{3-1} = 3x^2$

b) Find $f'(2)$ *(1 point)*:

$f'(2) = 3 \cdot 2^2 = 12$

1)

a) NOTE: There should be an open circle at (2,12).




2)

a) NOTE: There should be open circles at (-1,1) and (-1,-1) and there should not be a vertical line connecting those two points.