Quiz 6

September 16, 2016

Show all work and circle your final answer.

1. Find all asymptotes (vertical and horizontal) of $y = \dfrac{\sqrt{2x^2 - x + 1}}{x - 1}$.

HA's: $\lim_{x\to\infty} \dfrac{\sqrt{2x^2-x+1}}{x-1} \cdot \dfrac{1/\sqrt{x^2}}{1/x} = \lim_{x\to\infty} \dfrac{\sqrt{2-1/x+1/x^2}}{1-1/x} = \sqrt{2}$

$\lim_{x\to-\infty} \dfrac{\sqrt{2x^2-x+1}}{x-1} \cdot \dfrac{1/-\sqrt{x^2}}{1/x} = \lim_{x\to\infty} \dfrac{-\sqrt{2-1/x+1/x^2}}{1-1/x} = -\sqrt{2}$

VA's : $x-1=0$ when $x=1$, and $2(1)^2-1+1\neq 0$

$\boxed{y=\sqrt{2} \quad y=-\sqrt{2} \quad x=1}$

2. Use the limit definition of the derivative to find $f'(a)$ if $f(x) = \dfrac{3x}{x+1}$.

$f'(a) = \lim_{x\to a} \dfrac{\frac{3x}{x+1} - \frac{3a}{a+1}}{x-a}$

$= \lim_{x\to a} \dfrac{3x(a+1) - 3a(x+1)}{(x-a)(x+1)(a+1)}$

$= \lim_{x\to a} \dfrac{3\cancel{(x-a)}}{\cancel{(x-a)}(x+1)(a+1)}$

$= \boxed{\dfrac{3}{(a+1)^2}}$

OR

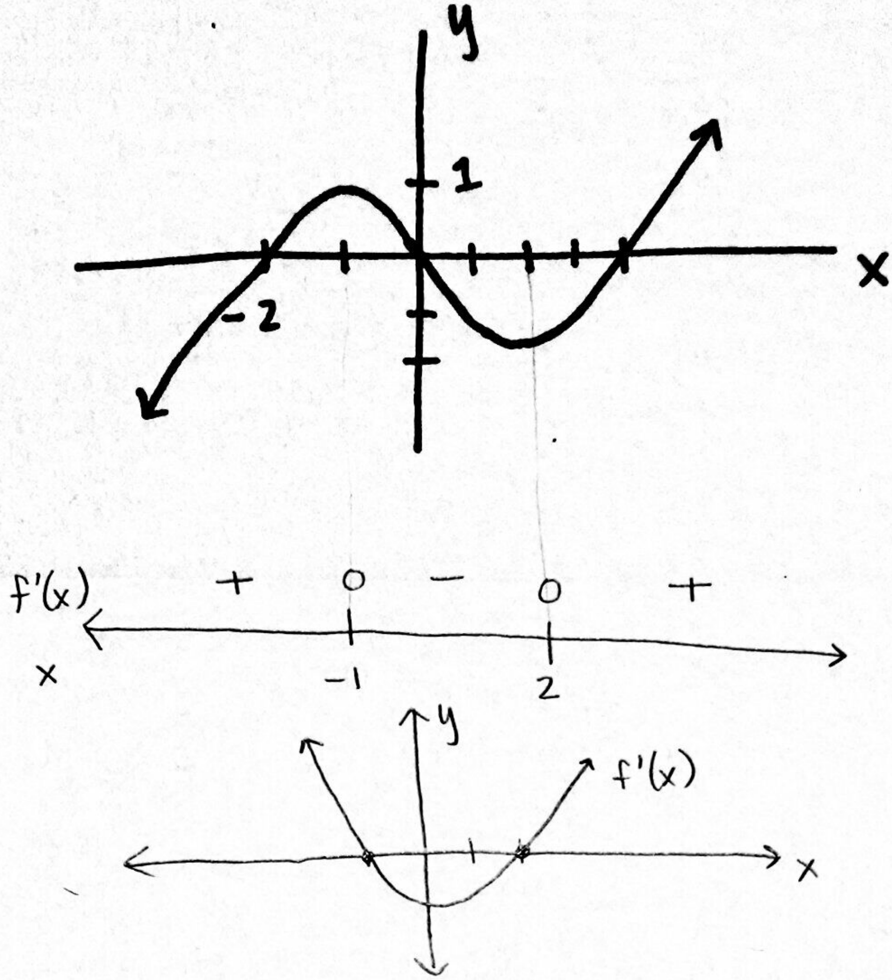
$f'(a) = \lim_{h\to 0} \dfrac{\frac{3(a+h)}{a+h+1} - \frac{3a}{a+1}}{h}$

$= \lim_{h\to 0} \dfrac{3(a+h)(a+1) - 3a(a+h+1)}{h(a+h+1)(a+1)}$

$= \lim_{h\to 0} \dfrac{\cancel{3a^2} + \cancel{3a} + \cancel{3ah} + 3h - \cancel{3a^2} - \cancel{3ah} - \cancel{3a}}{h(a+h+1)(a+1)}$

$= \lim_{h\to 0} \dfrac{3\cancel{h}}{\cancel{h}(a+h+1)(a+1)} = \boxed{\dfrac{3}{(a+1)^2}}$

3. Sketch a graph of the derivative of the function below.


y
1
x
-2
f'(x)
+
0
−
0
+
x
-1
2
y
f'(x)
x