

Math 131, Fall 2016  
Quiz 2, September 29, 2016  
For all 8 a.m. Sections

Show enough work to make it clear how you got your answer.  
Do NOT use any methods except those discussed so far in this course.

1. For  $y = f(x) = \frac{2+x}{x+1}$ , find  $f'(1)$ .

$$\text{Quot. Rule: } f'(x) = \frac{(x+1)(1) - (2+x)(1)}{(x+1)^2}$$
$$\text{so } f'(1) = \frac{2-3}{2^2} = -1/4$$

2. Use the definition of derivative to find  $f'(x)$  for the function  $f(x) = \frac{1}{x+2}$   
Perform reasonable simplifications to your answer.

$$f'(x) = \lim_{h \rightarrow 0} \frac{\frac{1}{x+h+2} - \frac{1}{x+2}}{h} = \lim_{h \rightarrow 0} \frac{\frac{(x+2) - (x+h+2)}{(x+h+2)(x+2)}}{h}$$
$$= \lim_{h \rightarrow 0} \frac{-h}{h(x+h+2)(x+2)}$$
$$= -\frac{1}{(x+2)^2}$$

Math 131, Fall 2016  
Quiz 2, September 29, 2016  
For all 9 a.m. Sections

Show enough work to make it clear how you got your answer.  
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1. For  $y = f(x) = \frac{x^2}{2x+1}$ , find  $f'(1)$ .

Quot. Rule:  $f'(x) = \frac{(2x+1)(2x) - (x^2)(2)}{(2x+1)^2}$   
so  $f'(1) = \frac{(3)(2) - 2}{3^2} = \frac{4}{9}$

2. Use the definition of derivative to find  $f'(x)$  for the function for  $f(x) = x^2 - x$   
Perform reasonable simplifications to your answer.

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{(x+h)^2 - (x+h) - (x^2 - x)}{h} = \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - x - h - x^2 + x}{h} \\ &= \lim_{h \rightarrow 0} \frac{2xh + h^2 - h}{h} = \lim_{h \rightarrow 0} \frac{h(2x + h - 1)}{h} \\ &= 2x - 1 \end{aligned}$$

Math 131, Fall 2016  
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 For all 10 a.m. Sections

Show enough work to make it clear how you got your answer.  
Do NOT use any methods except those discussed so far in this course.

1. For  $y = f(x) = \frac{xe^x}{1+x}$ , find  $f'(0)$ .

Quot. Rule  
 and  
 Prod. Rule:

$$f'(x) = \frac{(1+x)(xe^x)' - (xe^x)(1)'}{(1+x)^2}$$

$$= \frac{(1+x)(xe^x + e^x) - xe^x}{(1+x)^2}$$

$$\text{so } f'(0) = \frac{1(0 + e^0) - 0}{1^2} = 1$$

2. Use the definition of derivative to find  $f'(x)$  for the function for  $f(x) = \frac{x}{x+1}$   
 Perform reasonable simplifications to your answer.

$$f'(x) = \lim_{h \rightarrow 0} \frac{\frac{x+h}{x+h+1} - \frac{x}{x+1}}{h} = \lim_{h \rightarrow 0} \frac{\frac{(x+h)(x+1) - x(x+h+1)}{(x+h+1)(x+1)}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{x^2} + \cancel{hx} + \cancel{x} + h - \cancel{x^2} - \cancel{xh} - \cancel{x}}{h(x+h+1)(x+1)}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{h}}{\cancel{h}(x+h+1)(x+1)} = \frac{1}{(x+1)^2}$$

Math 131, Fall 2016  
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 For all 11 a.m. Sections

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1. For  $y = f(x) = \frac{4}{x} + \frac{x}{1+x}$ , find  $f'(1)$ .

$$\begin{aligned}
 & \left. \begin{array}{l} \text{Power Rule} \\ + \\ \text{Quot. Rule} \end{array} \right\} \begin{aligned} &= 4x^{-1} + \frac{x}{1+x} \\ &f'(x) = -4x^{-2} + \frac{(1+x)(1) - x(1)}{(1+x)^2} \\ &= \frac{-4}{x^2} + \frac{1}{(x+1)^2} \end{aligned} \\
 &\text{so } f'(1) = -4 + \frac{1}{(1+1)^2} = -\frac{16}{4} + \frac{1}{4} = -\frac{15}{4}
 \end{aligned}$$

2. Use the definition of derivative to find  $f'(x)$  for the function for  $f(x) = \frac{x+1}{x}$   
 Perform reasonable simplifications to your answer.

$$\begin{aligned}
 f'(x) &= \lim_{h \rightarrow 0} \frac{\frac{x+h+1}{x+h} - \frac{x+1}{x}}{h} = \lim_{h \rightarrow 0} \frac{\frac{x(x+h+1) - (x+h)(x+1)}{(x+h)x}}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{x^2} + hx + x - \cancel{x^2} - hx - x - h}{h(x+h)(x)} \\
 &= \lim_{h \rightarrow 0} \frac{-h}{h(x+h)(x)} = \frac{-1}{x^2}
 \end{aligned}$$

Math 131, Fall 2016  
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 For all 12 p.m. Sections

Show enough work to make it clear how you got your answer.  
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1. For  $y = f(z) = (1 - e^z)(z + e^z)$ , find  $f'(0)$ .

Prod. Rule.

$$\begin{aligned} f'(z) &= (1 - e^z)(z + e^z)' + (z + e^z)(1 - e^z)' \\ &= (1 - e^z)(1 + e^z) + (z + e^z)(-e^z) \\ \text{So } f'(0) &= (1 - 1)(1 + 1) + (0 + 1)(-1) = -1 \end{aligned}$$

2. Use the definition of derivative to find  $f'(x)$  for the function for  $f(x) = \frac{x}{2x+3}$   
 Perform reasonable simplifications to your answer.

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{\frac{x+h}{2(x+h)+3} - \frac{x}{2x+3}}{h} = \lim_{h \rightarrow 0} \frac{\frac{(x+h)(2x+3) - x(2(x+h)+3)}{(2(x+h)+3)(2x+3)}}{h} \\ &= \lim_{h \rightarrow 0} \frac{\cancel{2x^2} + \cancel{2xh} + \cancel{3x} + 3h - \cancel{2x^2} - \cancel{2xh} - \cancel{3x}}{h(2(x+h)+3)(2x+3)} \\ &= \lim_{h \rightarrow 0} \frac{3}{(2(x+h)+3)(2x+3)} = \frac{3}{(2x+3)^2} \end{aligned}$$