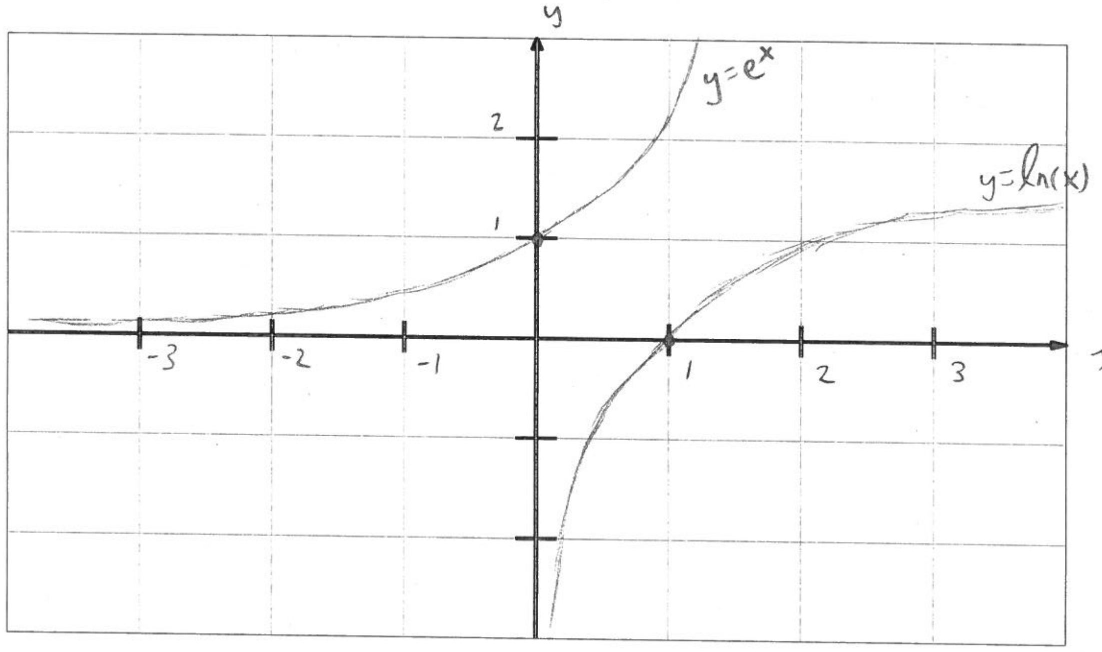
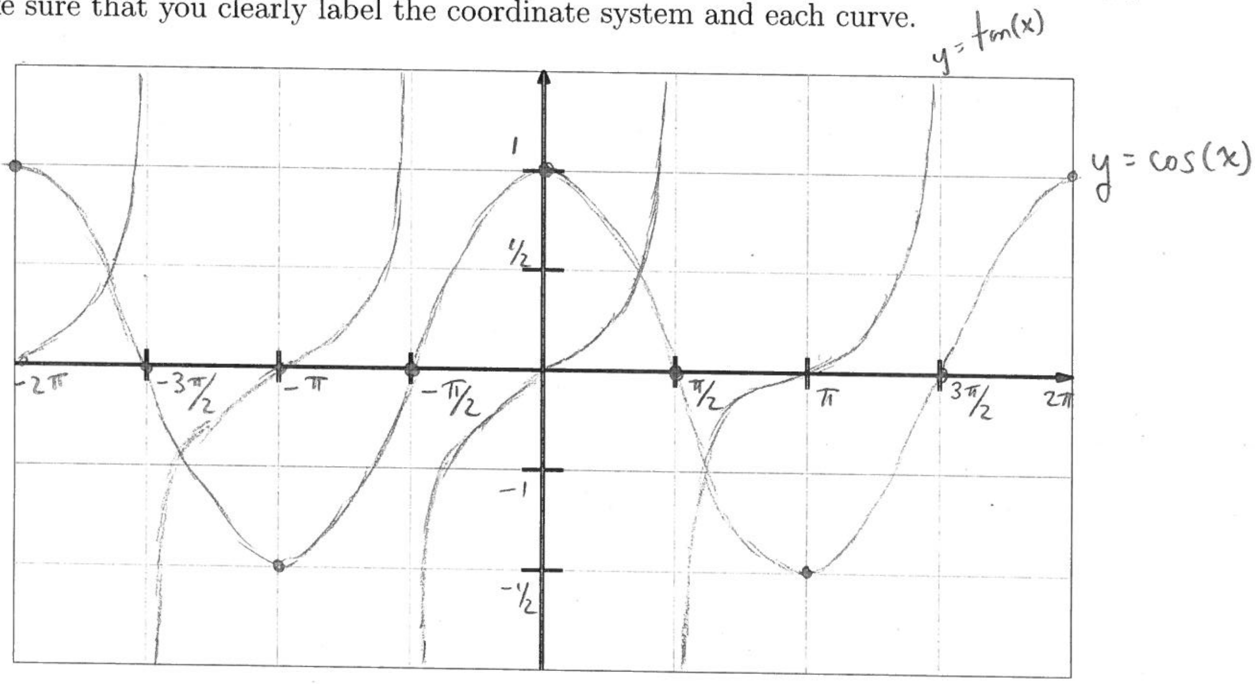
Math 1210: Worksheet #1 **Fall 2017**

Name: Solutions	A#:	Section: G

[4] 1. In the coordinate system below sketch the graphs of the functions $y = e^x$ and $y = \ln(x)$. Make sure that you clearly label the coordinate system and each curve.



[4] 2. In the coordinate system below sketch the graphs of the functions $y = \cos(x)$, $y = \tan(x)$. Make sure that you clearly label the coordinate system and each curve.



[4] 3. Find the equation of the secant line to the curve $y = \ln(x)$ on the interval $[e, e^3]$. Write the equation in the "slope, y-intercept form" and simplify as much as possible.

Have points: $(e, \ln(e)) = (e, 1)$

$(e^3, \ln(e^3)) = (e^3, 3\ln(e)) = (e^3, 3)$

Slope $= \dfrac{3-1}{e^3-e} = \dfrac{2}{e(e^2-1)}$

Eq of line: $(y-1) = \dfrac{2}{e(e^2-1)}(x-e)$

$$y-1 = \left(\frac{2}{e(e^2-1)}\right)x - \frac{2e}{e(e^2-1)}$$

$$y = \left(\frac{2}{e(e^2-1)}\right)x - \frac{2}{e^2-1} + 1$$

$$y = \left(\frac{2}{e(e^2-1)}\right)x + \frac{-2+e^2-1}{e^2-1}$$

$$\boxed{y = \left(\frac{2}{e(e^2-1)}\right)x + \frac{e^2-3}{e^2-1}}$$

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$g(h(x)) = e^{x-3}$

[2] 4. If $f(x) = \ln(x^3 - 2x^2 + 1)$, $g(x) = e^x$ and $h(x) = x - 3$, then

$(f \circ g \circ h)(x) = f(g(h(x))) = f(e^{x-3}) = \ln((e^{x-3})^3 - 2(e^{x-3})^2 + 1)$

$= \ln(e^{3x-9} - 2e^{2x-6} + 1)$

[6] 5. Perform the required task and **simplify**.

(a) Write $\dfrac{x^2 + \sqrt[5]{x}}{x^3}$ as a sum of summands of the form x^a.

$$\frac{x^2 + x^{1/5}}{x^3} = (x^2 + x^{1/5})\, x^{-3} = x^{2-3} + x^{1/5 - 3}$$

$$= x^{-1} + x^{-14/5}$$

(b) Find a common denominator. $\dfrac{4}{x+1} - \dfrac{3}{x} =$

$$\frac{4}{x+1} - \frac{3}{x} = \frac{4x}{x(x+1)} - \frac{3(x+1)}{x(x+1)} = \frac{4x - 3x - 3}{x(x+1)}$$

$$= \boxed{\frac{x-3}{x(x+1)}}$$

(c) Expand. $(x^2 + x + 3)(x^2 - 2x + 3) =$

$$= x^4 - 2x^3 + 3x^2 + x^3 - 2x^2 + 3x + 3x^2 - 6x + 9$$

$$= x^4 - 2x^3 + x^3 + 3x^2 - 2x^2 + 3x^2 + 3x - 6x + 9$$

$$= x^4 - x^3 + 4x^2 - 3x + 9$$

(d) Rationalize and cancel if possible. $\dfrac{x-3}{\sqrt{x^2 - 5x + 10} - 2} = \dfrac{x-3}{\sqrt{x^2-5x+10} - 2} \cdot \dfrac{\sqrt{x^2-5x+10} + 2}{\sqrt{x^2-5x+10} + 2}$

$$= \frac{(x-3)(\sqrt{x^2-5x+10} + 2)}{\underbrace{x^2 - 5x + 10 - 4}_{= x^2-5x+6}} = \frac{\cancel{(x-3)}(\sqrt{x^2-5x+10} + 2)}{\cancel{(x-3)}(x-2)} = \boxed{\frac{\sqrt{x^2-5x+10} + 2}{x-2}}$$

(e) Simplify. $\dfrac{(e^x)^{x-1} e^{x-1}}{e^{x - \frac{5}{4}}} =$

$$= \frac{e^{x^2-x} \cdot e^{x-1}}{e^{x-5/4}} = e^{x^2 - x + x - 1} \cdot e^{5/4 - x} = e^{x^2 - 1 + 5/4 - x}$$

$$= e^{x^2 - x + 1/4}$$

(f) Simplify. $\ln(3e^x/5) + \ln(5e^x) - \ln(3e^{x^3}) =$

$= \ln(3/5) + \ln(e^x) + \ln(5) + \ln(e^x) - \ln(3) - \ln(e^{x^3})$ ← Recall $\ln(e^a) = a$

$= \ln(3/5) + x + \ln(5) + x - \ln(3) - x^3$

$= \cancel{\ln(3)} - \cancel{\ln(5)} + x + \cancel{\ln(5)} + x - \cancel{\ln(3)} - x^3$

$= 2x - x^3 = x(2 - x^2)$

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