Math 100 – WORKSHEET 7
TRIGONOMETRIC FUNCTIONS; THE CHAIN RULE

1. Trigonometric Functions

Fact. *When x is measured in **radians**, we have* $(\sin x)' = \cos x$, $(\cos x)' = -\sin x$

(1) (Special values) What is $\sin \frac{\pi}{3}$? What is $\cos \frac{5\pi}{2}$?

(2) Derivatives of trig functions

(a) Interpret $\lim_{h\to 0} \frac{\sin h}{h}$ as a derivative and find its value.

(b) Differentiate $\tan\theta = \frac{\sin\theta}{\cos\theta}$.

(c) What is the equation of the line tangent the graph $y = T\sin x + \cos x$ at the point where $x = \frac{\pi}{4}$? Here T is a parameter (=constant).

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2. The Chain Rule

Fact. $(f(g(x)))' = f'(g(x))\,g'(x)$ *or* $\frac{\mathrm{d}}{\mathrm{d}x}(f(g(x))) = \frac{df}{dg}\cdot\frac{dg}{dx}$.

(1) Write the function as a composition and then differentiate.
   (a) e^{3x}

   (b) $\sqrt{2x+1}$

   (c) (Final, 2015) $\sin(x^2)$

   (d) $(7x+\cos x)^n$.

(2) Differentiate
   (a) $7x+\cos(x^n)$

   (b) $e^{\sqrt{\cos x}}$

   (c) (Final 2012) $e^{(\sin x)^2}$