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(Fall 2018)

Rhoda's Review Exercises

Calculus I (Maths 201–NYA)

Trigonometry

1. Find the following values without a calculator or notes:

   (a) $\sin(\pi/3)$
   (b) $\csc(-5\pi/6)$
   (c) $\cot(\pi/2)$
   (d) $\cos(13\pi/4)$
   (e) $\tan(7\pi/2)$
   (f) $\sin^3(5\pi/4)(\sec^2(\pi/3) - \csc^2(\pi/3))$

2. Solve for x over the specified interval:

   (a) $6\sin(x) = \sqrt{18}$, on $[0, 2\pi)$
   (b) $2\cos(x) + 2 = 1$, on $[-\pi, \pi)$
   (c) $1 + \sin(x) = 1 - \cos(x)$, on $[0, 2\pi)$
   (d) $\tan(5x) = \sqrt{3}$, on $[0, \pi]$
   (e) $6\csc(2x - \frac{\pi}{3}) = 12$, on $[-\pi/2, \pi/2]$
   (f) $\sin^2(x) = \frac{1}{2}$, on $[0, 2\pi)$
   (g) $\sin^2(x) - 2\cos(x) = \cos^2(x) - \cos(x)$, on $[0, 2\pi)$

Common Errors

3. Find the mistake(s):

   (a)

   $$(\cos(x) + \sin(x))^2 = \cos^2(x) + \sin^2(x) = 1$$

   (b)

   $$\begin{aligned} x\sin(x) &= 4\sin(x) \\ x &= 4 \end{aligned}$$

   (c)

   $$\begin{aligned} x^2 - 6x + 9 &= 16 \\ (x-3)^2 &= 16 \\ x - 3 &= 4 \\ x &= 7 \end{aligned}$$

(d)

$$\begin{aligned}\frac{\sqrt{x^4-8x^3-7x^2}}{\ln(x^3-x)} &= \frac{\sqrt{x^2(x^2-8x-7)}}{\ln(x(x^2-1))}\\ &= \frac{x\sqrt{x^2-8x-7}}{\ln(x(x^2-1))}\\ &= \frac{\sqrt{x^2-8x-7}}{\ln(x^2-1)}\\ &= \frac{\sqrt{(x-1)(x-7)}}{\ln((x-1)(x+1))}\\ &= \frac{\sqrt{x-7}}{\ln(x+1)}\end{aligned}$$

(e)

$$\begin{aligned}\frac{64-(x-1)^3}{(x-1)(x-5)} &= \frac{64-(x-1)^2}{x-5}\\ &= \frac{(8-x-1)(8+x-1)}{x-5}\\ &= \frac{(7-x)(7+x)}{x-5}\\ &= \frac{x^2-49}{x-5}\end{aligned}$$

(f) Let $f(x)=\sqrt{2x+1}$.
Then

$$\begin{aligned}\frac{f(x+h)-f(x)}{h} &= \frac{\sqrt{2x+1+h}-\sqrt{2x+1}}{h}\\ &= \frac{\sqrt{2x+1}+\sqrt{h}-\sqrt{2x+1}}{h}\\ &= \frac{\sqrt{h}}{h}\\ &= \frac{1}{\sqrt{h}}\end{aligned}$$

(g)

$$\begin{aligned}\frac{\sin(9-x^2)}{\cos(2x^2+8x+6)} &= \frac{\sin((x+3)(x-3))}{\cos(2(x+3)(x+1))}\\ &= \frac{\sin((x+3)(x-3))}{2\cos((x+3)(x+1))}\\ &= \frac{\sin(x-3)}{2\cos(x+1)}\end{aligned}$$