

Hello: This is for you to self-evaluate on what you need to review from Calculus, and from High-school mathematics, in order to be "up to speed" for our DIFFYQ course. At home, please take 80 minutes to write-up as many solutions as you can. Then use your calculus textbook and online-resources, to check your answers.

1: Show no work. NOTE: The inverse-fnc of g , often written as g^{-1} , is *different* from the reciprocal fnc $1/g$. E.g, suppose g is invertible with $g(-2) = 3$ and $g(3) = 8$: Then $g^{-1}(3) = -2$, yet $[1/g](3) \stackrel{\text{def}}{=} 1/g(3) = 1/8$.

Write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

l1 The **slope** of line $3[y - 5] = 2[x - 2]$ is _____.

Point $(-4, y)$ lies on this line, where $y =$ _____.

l2 Line $y = [M \cdot x] + B$ owns points $(4, 3)$ and $(-2, 5)$. Hence $M =$ _____ and $B =$ _____.

l3 Line $y = Mx + B$ is orthogonal to $y = \frac{1}{3}x + 2$ and owns $(2, 1)$. So $M =$ _____ and $B =$ _____.

q1 The solutions to $3x^2 = 2 - 2x$ are $x =$ _____.

q2 The four solutions to $[y - 2] \cdot y \cdot [y + 2] = -1/y$ are $y =$ _____.

[Hint: Apply the Quadratic Formula to y^2 .]

e1 $[\sqrt{3}^{\sqrt{2}}]^{\sqrt{8}} =$ _____ . $\log_{64}(16) =$ _____.

iv1 Let $y = f(x) := [2 + \sqrt[5]{x}]/3$. Its inverse-function is $f^{-1}(y) =$ _____.

iv2 Suppose g is a fnc with g' never zero. Let h be the inverse-fnc of g . In terms of h , g , g' and x , write a formula for $h'(x) =$ _____.

[Hint: The Chain rule. NOTE: h is NOT $1/g$.]

iv3 Let $g(x) := x^3 - x$. Then $g^{-1}(6) =$ _____.

and $[g^{-1}]'(6) =$ _____.

dq $\frac{d}{dz} \left(\frac{\sin(3z)}{\cos(z+1)} \right) = \frac{f(z)}{g(z)}$ where $f(z) =$ _____ and $g(z) =$ _____.

DC1 Below, f and g are differentiable fncs with

$$\begin{aligned} f(2) &= 3, & f(3) &= 5, & f'(2) &= 19, & f'(3) &= 17, \\ g(2) &= 11, & g(3) &= 13, & g'(2) &= \frac{1}{2}, & g'(3) &= 7, \\ f(5) &= 43, & g(5) &= 23, & f'(5) &= 41, & g'(5) &= 29. \end{aligned}$$

Define the composition $C := g \circ f$. Then $C(2) =$ _____ ; $C'(2) =$ _____.

Please write each answer as a product of numbers; do not multiply out. [Hint: The Chain rule.]

DC2 For $x > 0$, let $B(x) := x^x$. Its derivative is $B'(x) =$ _____.

[Hint: How is y^z , for $y > 0$, defined in terms of the exponential fnc?]

DC3 For $x > 0$, let $B(x) := x^{\sin(x)}$. Hence its derivative is $B'(x) = B(x) \cdot M(x)$, where $M(x)$ equals _____.

[Hint: How is y^z , for $y > 0$, defined ITO of the exponential fnc?]

Ig1 $\int_2^3 \log(t) dt = \log(R) + K$, where $R =$ _____ is a rational number and $K =$ _____ $\in \mathbb{Z}$. [Hint: IBParts]

Ig2 $\int \frac{t^2}{2^t} dt =$ _____ [Write ITO of $L := \log(2)$.]

Hop By l'Hôpital's thm or other means, please compute $\lim_{x \rightarrow 0} \frac{e^x - 1}{3x - 1} =$ _____ . $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin(2x)}{x - \frac{\pi}{2}} =$ _____ .

Paf Partial-fraction decomposition:

$$\frac{x+1}{x^2+x-2} = \frac{A}{x-1} + \frac{B}{x+2}$$