Quiz 3 Numerical Analysis Fall 2023

Name: _____ NetID: | | | | | | | | | | | |

Do not begin until instructed. Clearly justify each step.

Problem 1 (3pts)**.** What does the matrix $\begin{bmatrix} 0 & 0 & 3 \end{bmatrix}$ do when we multiply it on the left of a 3×5 matrix? Circle your answer.

(a) multiply the third row by 3

(b) multiply the third column by 3

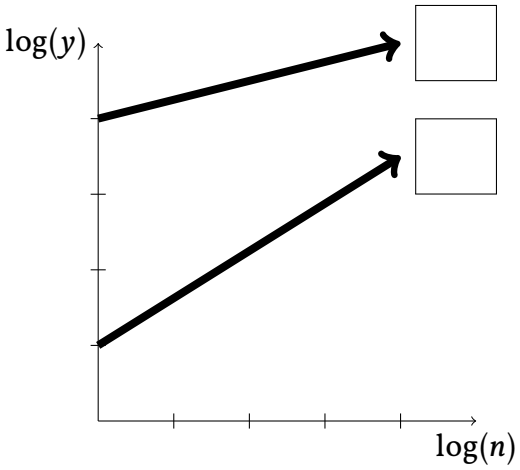
(c) extract the third row and multiply it by 3

(d) extract the third column and multiply it by 3

Problem 2 (3pts)**.** Match each of the functions to the picture (fill in the boxes with (a) or (b)):

(a) $y = 10n^2$

(b) $y = 2n^3$



Problem 3 (9pts)**.** Consider the following problem/task: Given a differentiable function $h(s)$, return the derivative function $h'(s)$.

Example inputs/outputs:

problem instance	solution to problem
$h(s) = 1$	0
$h(s) = s^2 + 2s$	$2s$
$h(s) = \sin(s)$	$\cos(s)$

We will define two functions $f(s)$ and $g(s)$ as near if $\|f - g\|_\infty := \max_{s\in[-1,1]} |f(s) - g(s)|$ is small.

a) In one or two sentences, explain what it would mean if this problem is poorly-conditioned.

b) Prove that this problem is poorly conditioned (annotated picture okay).