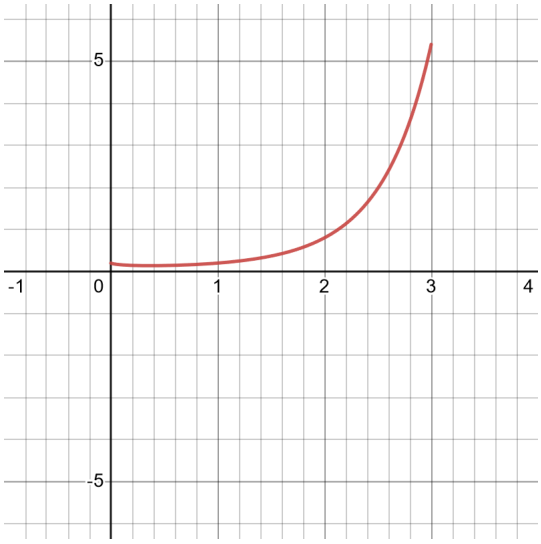
MATH 115 **Name:** _____

In class work 4, Fall 2022 **Row and Seat:** _____

In class work 4 has questions 1 through 4 with a total of 9 points. Turn in your work at the end of class *on paper*. This assignment is due *Wednesday 14 September 13:15* PM.

[1] 1. Shown below is a graph of a function Q. Use the graph to estimate the numerical value of $Q'(2)$.



1 2. In the year 1969 at age 11, child actress Eve Plumb purchased a Malibu beach house for $55,000. Forty-seven years later she sold it for $3.9 million. Her annual percent yield r on this investment is given by the solution to

$$3,900,000 = 55,000 \times (1+r)^{47}.$$

Find Eve Plumb's return on this investment.

1 3. When a Nebraska judge resigns, the judge receives a lifetime pension of P dollars per year that depends on their ending salary S and their years of service Y. The formula for the pension is

$$P = S \begin{cases} \frac{35}{1000} Y & Y \le 20 \\ \frac{7}{10} & Y > 20 \end{cases}. \tag{1}$$

1 (a) Using $S = 1$, draw a graph of this function. That is, draw a graph of

$$P = \begin{cases} \frac{35}{1000} Y & Y \le 20 \\ \frac{7}{10} & Y > 20 \end{cases}.$$

1 (b) Using the graph, draw a graph of $\frac{dP}{dY}$. Is the function differentiable at $Y = 20$?

4. Using our list of rules for computing derivatives, find each derivative. *Justify each step by stating which rule you used.*

1 (a) $\frac{d}{dx}\left[\cos(2)x^2 + \sin(2)x + 46\right]$

1 (b) $\frac{d}{dx}\left[\sin(3)x^2 + \ln(107)x\right]$

1 (c) $\frac{d}{dx}\left[\frac{(x^2+1}{x}\right]$

1 (d) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left[x^{\mathrm{e}} = \mathrm{e}^{x}\right]$

For any real number a and any real number n, we have

Rule #0 (constant) $\dfrac{\mathrm{d}}{\mathrm{d}x}[a] = 0.$

Rule #1 (linearity) $\dfrac{\mathrm{d}}{\mathrm{d}x}[aF(x) + bG(x)] = aF'(x) + bG'(x).$

Rule #2 (power) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left[x^{n}\right] = nx^{n-1}$

Rule #3 (natural exponential) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left[\mathrm{e}^{x}\right] = \mathrm{e}^{x}$