FIVE MINUTE REVIEW FOR WEEK 9.

Question 1. *Simplify* $\frac{x^2-4x+3}{x^2-9}$. *(On the quiz in class there was a typo: the numerator read "x^2-4+3".)*

Answer 1.

$$\frac{x^2-4x+3}{x^2-9} = \frac{(x-3)(x-1)}{(x-3)(x+3)} = \frac{x-1}{x+3}$$

Question 2. *Simplify* $e^{\log 10 - \log 5}$.

Answer 2.

$$e^{\log 10 - \log 5} = e^{\log \frac{10}{5}} = e^{\log 2} = 2$$

Question 3. $\begin{bmatrix} 1 \\ 5 \end{bmatrix} + \begin{bmatrix} 7 \\ -3 \end{bmatrix} =$*?*

Answer 3.

$$\begin{bmatrix} 1 \\ 5 \end{bmatrix} + \begin{bmatrix} 7 \\ -3 \end{bmatrix} = \begin{bmatrix} 1+7 \\ 5-3 \end{bmatrix} = \begin{bmatrix} 8 \\ 2 \end{bmatrix}$$

Question 4. *What is the length of the vector* $(1,1,1)$*?*

Answer 4.

$$\|(1,1,1)\| = \sqrt{1^2+1^2+1^2} = \sqrt{3}$$

Question 5. *What is the gradient of the function* $f(x,y) = x^2y - e^y$*?*

Answer 5.

$$\nabla f = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}\right) = (2xy, x^2 - e^y)$$

Question 6. $\frac{d}{d\theta}\left(\log\left(e^{\sin\theta}\right)\right) =$*?*

Answer 6.

$$\frac{d}{d\theta}\left(\log\left(e^{\sin\theta}\right)\right) = \frac{d}{d\theta}(\sin\theta) = \cos\theta$$

Question 7. *What is the length of the vector* $(2,-1)$*?*

Answer 7.

$$\|(2,-1)\| = \sqrt{2^2+(-1)^2} = \sqrt{4+1} = \sqrt{5}$$

Question 8. $\frac{d}{dx}(\log(5^x)) =$*?*

Answer 8.

$$\frac{d}{dx}(\log(5^x)) = \frac{d}{dx}\left(\log(e^{x\log 5})\right) = \frac{d}{dx}(x\log 5) = \log 5$$

Question 9. $\int_{-10}^{1} 0x^3 e^{-2|x|^9}\,dx =$*?*

Answer 9. The integrand is odd, and we are integrating over an interval centred at 0; hence the integral is 0.

Question 10. *Simplify (and find radius of convergence of)* $\sum_{n\geq 0} \frac{t^{n+1}}{n+1}$.

Answer 10.

$$\sum_{n\geq 0} \frac{t^{n+1}}{n+1} = \sum_{n\geq 0} \int_0^t s^n ds = \int_0^t \left(\sum_{n\geq 0} s^n\right) ds = \int_0^t \frac{ds}{1-s} = \log(1-t)$$

The radius of convergence of the series is the same as for the geometric series, i.e. $|t| < 1$.

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