2. [6 points] Compute the **exact** value of each of the following, if possible. Your answers should not involve integration signs, ellipses or sigma notation. For any values which do not exist, write **DNE**. You do not need to show work.

a. [2 points] The value of $G'(2)$ if $G(x) = \int_1^{3-x} e^{t^3}\,dt$.

Solution: Note that

$$G'(x) = e^{(3-x)^3}(-1) = -e^{(3-x)^3}$$

Therefore, $G'(2) = -e^{(3-2)^3} = -e^{1^3} = -e$.

Answer: $-e$

b. [2 points] The infinite sum $-1 + \frac{5^2}{2!} - \frac{5^4}{4!} + \frac{5^6}{6!} - \cdots + \frac{(-1)^{n+1}5^{2n}}{(2n)!} + \cdots$.

Solution: Using the Taylor series expansion for $\cos(x)$, we obtain

$$\cos(5) = 1 - \frac{5^2}{2!} + \frac{5^4}{4!} - \frac{5^6}{6!} + \cdots + \frac{(-1)^n 5^{2n}}{(2n)!} + \cdots$$

Hence, the value of the infinite sum above is $-\cos(5)$.

Answer: $-\cos(5)$

c. [2 points] The infinite sum $\sum_{n=0}^{\infty} 3(4^n)$.

Solution: This sum is an infinite geometric series with a common ratio 4. Therefore, the series diverges.

Answer: **DNE**

3. [8 points] The two parts of this problem ask about **the same** series. No justification is required for your answers.

a. [4 points] Which of the following series converge? Circle **all** options that apply.

i. $\boxed{\sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}}$

ii. $\sum_{n=1}^{\infty} \frac{(-1)^n n}{n+3}$

iii. $\sum_{n=1}^{\infty} \frac{(-1)^{2n}}{n^{1/2}}$

iv. $\boxed{\sum_{n=1}^{\infty} \frac{(-4)^n}{5^n}}$

v. $\boxed{\sum_{n=1}^{\infty} \frac{\sin(n)}{n^2}}$

vi. $\boxed{\sum_{n=3}^{\infty} \frac{(-1)^n}{n\ln(n)}}$

vii. NONE OF THESE

b. [4 points] Which of the following series converge **conditionally**? Circle **all** options that apply.

i. $\boxed{\sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}}$

ii. $\sum_{n=1}^{\infty} \frac{(-1)^n n}{n+3}$

iii. $\sum_{n=1}^{\infty} \frac{(-1)^{2n}}{n^{1/2}}$

iv. $\sum_{n=1}^{\infty} \frac{(-4)^n}{5^n}$

v. $\sum_{n=1}^{\infty} \frac{\sin(n)}{n^2}$

vi. $\boxed{\sum_{n=3}^{\infty} \frac{(-1)^n}{n\ln(n)}}$

vii. NONE OF THESE