Multiple Choice. Circle the best answer. No work needed. No partial credit available.

Q1 Which statement is true about the series

$$\sum_{n=1}^{\infty} e^{\frac{2}{n}}$$

A The **nth term test** concludes that the series converges.

B The **nth term test** concludes that the series diverges.

C The **nth term test** hypotheses are not met by this series, so it cannot be applied.

D The **nth term test** hypotheses are met by this series however the test is inconclusive.

E None of the above are true. The nth term test concludes that the series converges.

Q2 Which statement is true about the series

$$\sum_{n=2}^{\infty} \frac{2\ln n}{n}$$

A The **integral test** concludes that the series converges.

B The **integral test** concludes that the series diverges.

C The **integral test** hypotheses are not met by this series, so it cannot be applied.

D The **integral test** hypotheses are met by this series however the test is inconclusive.

E None of the above are true.

Q3 Determine whether the following series are absolutely convergent, conditionally convergent, or divergent:

$$(1) \quad \sum_{n=1}^{\infty} \frac{\sin(2n)}{n^2} \qquad \text{and (2)} \quad \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{3n}$$

A (1) is absolutely convergent; (2) is divergent.

B (1) is conditionally convergent; (2) is divergent.

C (1) is absolutely convergent; (2) is conditionally convergent.

D (1) is divergent; (2) is conditionally convergent.

E (1) and (2) are conditionally convergent.

Q4 Determine whether the following series converge or diverge.

(a)

$$\sum_{n=1}^{\infty} \frac{\sqrt{n}+1}{e^n}$$

(b)

$$\sum_{n=1}^{\infty} \frac{\sqrt{n^2+n^3}}{3n^2+7n}$$

(c)

$$\sum_{n=1}^{\infty} \frac{n+1}{\sqrt{4n^5-1}}$$

Q5 Check the convergence/divergence of

$$\sum_{n=1}^{\infty} \frac{2n}{n^2 + 1}$$

using integral test. (Note: you need to check the series satisfies ALL the THREE hypotheses of integral test.)

Q6 Find the exact arc-length of $f(x) = \frac{2}{3}(x^2 + 1)^{3/2}$ from $x = 0$ to $x = 2$.

Q7 What does the series $-2 + \frac{6}{5} - \frac{18}{25} + \frac{54}{125} + \cdots$ converge to? Find the sum.

Q8 Find the sum of the series
$$\sum_{n=1}^{\infty} \frac{9^{n/2}}{3(2^{2n+1})}$$

Q9 Find the radius of convergence of
$$\sum_{n=0}^{\infty} \frac{x^n(n^2+3)}{(-5)^n}$$

Q10 Find the first three non-zero terms of the power series representation of the function

$$f(x) = 1 - \frac{x}{1 + 2x^2}$$

Q11 Find the power series representation and the radius of convergence of the function

$$f(x) = \frac{x^2}{3x + 2}$$

Q12 Find the 3rd degree Taylor polynomial of $f(x) = 2 + \cos(x)$ centered at $a = \pi/3$

Q13 Find the first three non-zero terms of the Taylor series at $x = 0$ for $f(x) = 3\sin(2x) + x^2$.