

Note: This is a practice exam and is intended only for study purposes. The actual exam will contain different questions and may have a different layout. For instance, there *will be* true/false questions.

- You are allowed one double-sided 3×5” note card.
- You are allowed to use a calculator.
- Box your answer to clearly indicate your final answer.
- You must show your work for full credit.
- Keep as many decimal places as you can when rounding. Exact expressions where possible.
- Make sure you have 7 pages, including this one.

1. (15) _____

2. (15) _____

3. (10) _____

4. (10) _____

5. (10) _____

6. (15) _____

Total (85) _____

1. (15 points) Determine whether the following series is convergent or divergent. If it is convergent, compute the sum.

(a)

$$\sum_{n=0}^{\infty} \frac{n+1}{3n+2}$$

(b)

$$\sum_{n=1}^{\infty} \frac{(-3)^{n-1}}{4^n}$$

(c)

$$\sum_{n=0}^{\infty} (-1)^n \frac{1}{(2n)!}$$

2. (15 points) Let $g(x) = \sqrt{5 + x^2}$.

(a) Find the second order Taylor polynomial $T_2(x)$ at $b = 2$.

(b) Approximate $g(2.2)$ using $T_2(x)$.

(c) Use Taylor's inequality to find an upper bound for the error in the approximation above.

3. (a) (5 points) Find the distance between the plane $x - y + 2z = 3$ and the point $(2, -1, 3)$.

(b) (5 points) Find the equation of the line of intersection between $x - y + 2z = 3$ and $x + 2y + 3z = 0$.

4. (10 points) Consider the quadratic surface given by the equation $2x^2 + 3y^2 - 5z^2 = 0$.

(a) Identify the surface.

(b) Find the equation of the tangent plane to the surface at the point $(1, 1, 1)$.

5. (10 points) Consider the function $h(x, y) = x^3 - 12xy + 8y^3$.

(a) Find all critical points of h .

(b) Classify each critical point as a local minimum, a local maximum, or a saddle point.

6. (15 points) Consider the double integral

$$\int_0^1 \int_x^1 e^{\frac{x}{y}} dy dx$$

(a) Sketch the region in the xy -plane where the integral is taken over.

(b) Switch the order of integration.

(c) Compute the double integral.