Points in each group:

Exercise 1 a. *(1 pt)*

Exercise 1 b. *(2 pts)*

Exercise 2 a. *(1 pt)*

Exercise 2 b. *(2 pts)*

Exercise 3. *(3 pts)*

Exercise 4. *(4 pts)*

Exercise 5. *(3 pts)*

Exercise 6. *(3 pts)*

Exercise 7. *(1 pt)*

GROUP A

Exercise 1 a. Give a definition of the ratio test for convergence of a series.

Exercise 1 b. Use the ratio test to estabilsh convergence of $\sum_{n=1}^{\infty} 2 \cdot \frac{7^n}{n!}$.

Exercise 2 a. Give the definition of absolute convergence of a series.

Exercise 2 b. Establish, if the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$ is absolutely convergent.

Exercise 3. Find and draw the domain of function $f(x,y) = \frac{1}{\sqrt{1-x^2-y^2}}$.

Exercise 4. Find the extremes of function $f(x,y) = (x-y+2)^2 + (2x+y-6)^2$.

Exercise 5. Calculate the approximated value of $0.99 \cdot \ln(1.02)$.

Exercise 6. Let $f(x,y) = x^2+y^2+xy^2+yx^2$. Check, if it is true (or false) that $\frac{\partial f}{\partial x}(x,y) - \frac{\partial f}{\partial y}(x,y) + 2(y-x) = y^2 - x^2$.

Exercise 7. Draw the graph of an ellipsoid (mark all axes and all radiuses) and write down its formula.

GROUP B

Exercise 1 a. Give a definition of the root test for convergence of a series.

Exercise 1 b. Use the root test to estabilsh convergence of $\sum_{n=1}^{\infty} (\frac{\pi}{n^2})^n$.

Exercise 2 a. Give the definition of conditional convergence of a series.

Exercise 2 b. Establish, if the series $\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{(n-1)^4}$ is absolutely convergent.

Exercise 3. Find and draw the domain of function $f(x,y) = \ln(x^2+y-2)$.

Exercise 4. Find the extremes of function $f(x,y) = 2(x+1)^2 + 3(y+2)^2$.

Exercise 5. Calculate the approximated value of $(1.06)^2 + 1.06 \cdot 1.97 + (1.97)^2$.

Exercise 6. Let $f(x,y) = x^2+y^2+xy$. Check, if it is true (or false) that $\frac{1}{3}(\frac{\partial f}{\partial x}(x,y) + \frac{\partial f}{\partial y}(x,y)) = y + x$.

Exercise 7. Draw the graph of a parabolic cylinder (mark all the axes) and write down its formula.

GROUP C

Exercise 1 a. How is the sequence of partial sums of a series connected with the convergence of that series?

Exercise 1 b. Use the limit of a sequence of partial sums to establish if the series $\sum_{n=9}^{\infty} \frac{1}{(n-7)(n-8)}$ is convergent.

Exercise 2 a. Give the definition of a p-series and write the conditions under which it is convergent.

Exercise 2 b. Establish, if the series $\sum_{n=12}^{\infty} (n-11)^{-3}$ is convergent.

Exercise 3. Show that the limit $\lim_{(x,y)\to(1,1)} \frac{x+y-1}{x^2+y^2-1}$ does not exist using any method you want.

Exercise 4. Find the extremes of function $f(x,y) = x^2y - 8x - 9y$.

Exercise 5. Find the plane tangent to $f(x,y) = x^{y+1}$ at a point $P(3,2,?)$.

Exercise 6. Let $f(x,y) = x\sin y + y\sin x$. Check, if it is true (or false) that $\frac{\partial^2 f}{\partial x^2}(x,y) + \frac{\partial^2 f}{\partial y^2}(x,y) = f(x,y)$.

Exercise 7. Draw the graph of a hyperboloid of one sheet (mark all axes) and write down its formula.

GROUP D

Exercise 1 a. Give the definition of an integral test for convergence of a series.

Exercise 1 b. Use the integral test to establish if the series $\sum_{n=4}^{\infty} \frac{\sqrt{n}}{n+1}$ is convergent.

Exercise 2 a. Give the definition of a necessary condition for convergence of a series.

Exercise 2 b. Show that the series $\sum_{n=1}^{\infty} \sqrt[n]{\frac{n}{100}}$ is divergent.

Exercise 3. Show that the limit $\lim_{(x,y)\to(\pi,0)} \frac{x^2y}{x^4+y^2-1}$ does not exist using any method you want.

Exercise 4. Find the extremes of function $f(x,y) = 15x + 8y - xy^2$.

Exercise 5. Find the plane tangent to $f(x,y) = (y+1)^x$ at a point $P(2,3,?)$.

Exercise 6. Let $f(x,y) = \ln x \ln y$. Check, if it is true (or false) that $\frac{\partial^2 f}{\partial x^2}(x,y) \cdot \frac{\partial^2 f}{\partial y^2}(x,y) = f(x,y) \cdot x^2y^2$.

Exercise 7. Draw the graph of a hyperboloid of two sheets (mark all axes) and write down its formula.