2. a) $\lim_{n\to\infty} \frac{3n^2-2n}{n^2+5n} \overset{\left(\frac{\infty-\infty}{\infty}\right)}{=} \lim_{n\to\infty} \frac{\cancel{n^2}(3-\frac{2}{n})}{\cancel{n^2}(1+\frac{5}{n})} = \lim_{n\to\infty} \frac{3-\overset{\to 0}{\frac{2}{n}}}{1+\underset{\to 0}{\frac{5}{n}}}$

$= \frac{3-0}{1+0} = \frac{3}{1} = \underline{3}$

b) $f(x,y) = xy + x^2$

Osittaisderivaatta muuttujan x suhteen: $f'_x(x,y) = y + 2x$

— " — — " — y — " —: $f'_y(x,y) = x$

$\begin{cases} f'_x(1,2) = 2 + 2\cdot 1 = \underline{4} \\ f'_y(1,2) = \underline{1} \end{cases}$

3. a) $100 \overset{\cdot q}{-} 110 \overset{\cdot q}{+} 121 - \ldots$

$\left.\begin{aligned} q &= \frac{-110}{100} = -1{,}1 \\ q &= \frac{121}{-110} = -1{,}1 \end{aligned}\right\} \Rightarrow |q| = |-1{,}1| = 1{,}1 < 1$ ↯

$\Rightarrow$ sarja hajaantuu

b) $9 \overset{\cdot q}{+} 3 \overset{\cdot q}{+} 1 + \ldots = \frac{9}{1-\frac{1}{3}} = \frac{9}{\frac{2}{3}} = \frac{9\cdot 3}{2} = \underline{\frac{27}{2}}$

$\left.\begin{aligned} q &= \frac{3}{9} = \frac{1}{3} \\ q &= \frac{1}{3} \end{aligned}\right\} \quad |q| = \left|\frac{1}{3}\right| = \frac{1}{3} < 1$ ✓ $\Rightarrow$ sarja suppenee

4. a) $\int_1^\infty \frac{1}{x}\,dx = I$

$\int_1^t \frac{1}{x}\,dx = \Big/_{1}^{t} \ln|x| = \ln t - \underbrace{\ln 1}_{=0} = \ln t \xrightarrow{t\to\infty} \ln\infty = \infty$

$\Rightarrow$ $\underline{I \text{ hajaantuu}}$

b) $\int_0^1 \frac{1}{\underbrace{\sqrt{x}}} \,dx = I$

määrittelemätön 0:ssa $\Rightarrow$ epäoleellinen integraali

$\int_r^1 \frac{1}{\sqrt{x}}\,dx = \int_r^1 \frac{1}{x^{\frac{1}{2}}}\,dx = \int_r^1 x^{-\frac{1}{2}}\,dx = \Big/_{r}^{1} \frac{1}{\frac{1}{2}} x^{\frac{1}{2}}$

$= \Big/_{r}^{1} 2\sqrt{x} = 2\cdot\sqrt{1} - 2\sqrt{r} \xrightarrow{r\to 0^+} 2 - 2\sqrt{0} = \underline{2 = I}$

5. $f(x) = \frac{4x^2-3x}{\underbrace{x^2+1}_{\geq 0}}$, f jatk. ja deriv. $\mathbb{R}$:ssä

a) $\underline{x \in \mathbb{R}}$