

Limits, Probability, and Statistics: math test, Grade 12 – download the PDF

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Limits

/ 4 pts

a. Find $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$.

b. Find $\lim_{x \rightarrow \infty} \frac{6x^2 - x}{3x^2 + 2}$.

c. Let $f(x) = \begin{cases} x + 3 & x < 2 \\ x^2 - 1 & x \geq 2 \end{cases}$. Find both one-sided limits at 2 and say whether $\lim_{x \rightarrow 2} f(x)$ exists.

2 Asymptotes

/ 3 pts

Find every vertical and horizontal asymptote of $g(x) = \frac{4x - 8}{x^2 - 9}$.

3 Counting

/ 3 pts

A coach has 9 players. (a) In how many ways can a captain, a co-captain, and a treasurer be named? (b) In how many ways can a group of 3 players be chosen to run an errand?

4 A café survey

/ 3 pts

At a café, 55% of customers order coffee (C), 30% order coffee and a pastry, and 20% order a pastry without coffee. Let P be "orders a pastry". (a) Find $P(P | C)$. (b) Find $P(C | P)$. (c) Are C and P independent?

5 Seeds and scores

/ 4 pts

(a) A seed sprouts with probability 0.8. Six seeds are planted independently. Find the probability that exactly 5 sprout and the expected number that sprout. (b) A typing speed is approximately normal with mean 120 and standard deviation 15 (characters per minute). Find the z-score of 150 and the percent of typists faster than 150.

6 Regression

/ 3 pts

The data (1, 8), (2, 7), (3, 5), (4, 4), (5, 1) give $\bar{x} = 3$, $\bar{y} = 5$, $\sum(x - \bar{x})(y - \bar{y}) = -17$, $\sum(x - \bar{x})^2 = 10$, $\sum(y - \bar{y})^2 = 30$. Calculator allowed. (a) Find the least-squares line. (b) Find r and interpret it. (c) Predict y when $x = 2.5$.



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