
Precalculus is graded on describing behaviour precisely: not “the graph goes up”, but “increasing at a decreasing rate”. The definitions below are the vocabulary that description requires, and using it verbatim is what earns the communication points.

Describing functions

- Function** – a rule assigning exactly one output to each input in the domain
- Domain** – the set of all inputs for which a function is defined
- Range** – the set of all outputs the function actually produces
- Increasing on an interval** – as input increases across the interval, output increases; concavity then says whether it does so at an increasing or a decreasing rate
- Concave up** – the rate of change is itself increasing, so the graph bends upward
- Point of inflection** – a point where concavity changes
- Average rate of change** – the change in output divided by the change in input over an interval
– the slope of the secant line
- Zero of a function** – an input at which the output is zero, corresponding to an x-intercept

Polynomial and rational functions

- Multiplicity** – the number of times a factor appears; an even multiplicity touches the x-axis, an odd one crosses it
- End behaviour** – what the output approaches as the input increases or decreases without bound, set by the leading term
- Vertical asymptote** – a line $x = a$ that the graph approaches where the denominator is zero and the numerator is not
- Horizontal asymptote** – a value the output approaches as the input grows without bound, determined by comparing the degrees of numerator and denominator
- Hole (removable discontinuity)** – a point where a common factor cancels, so the function is undefined at that input though the graph elsewhere is continuous

Exponential, logarithmic and trigonometric functions

- Exponential function** – a function of the form ab^x , in which output is multiplied by a constant factor for each unit increase in input
- Logarithm** – the inverse of an exponential: $\log_b(x)$ is the exponent to which b must be raised to give x
- Semi-log plot** – a plot with a logarithmic vertical axis, on which an exponential relationship appears linear
- Period** – the horizontal length of one complete cycle of a periodic function

- Amplitude** – half the difference between the maximum and minimum values of a sinusoid
- Midline** – the horizontal line halfway between the maximum and minimum of a sinusoid
- Phase shift** – a horizontal translation of a periodic function
- Radian** – the angle subtending an arc equal in length to the radius; 2π radians is one full revolution

Functions in context

Describe behaviour with BOTH direction and rate: “increasing at a decreasing rate” is a complete description; “increasing” is half of one.

When a model is fitted to data, state the meaning of each parameter IN CONTEXT and give its units.

Say whether a model’s prediction is an interpolation or an extrapolation, and note that extrapolation beyond the data is unreliable.