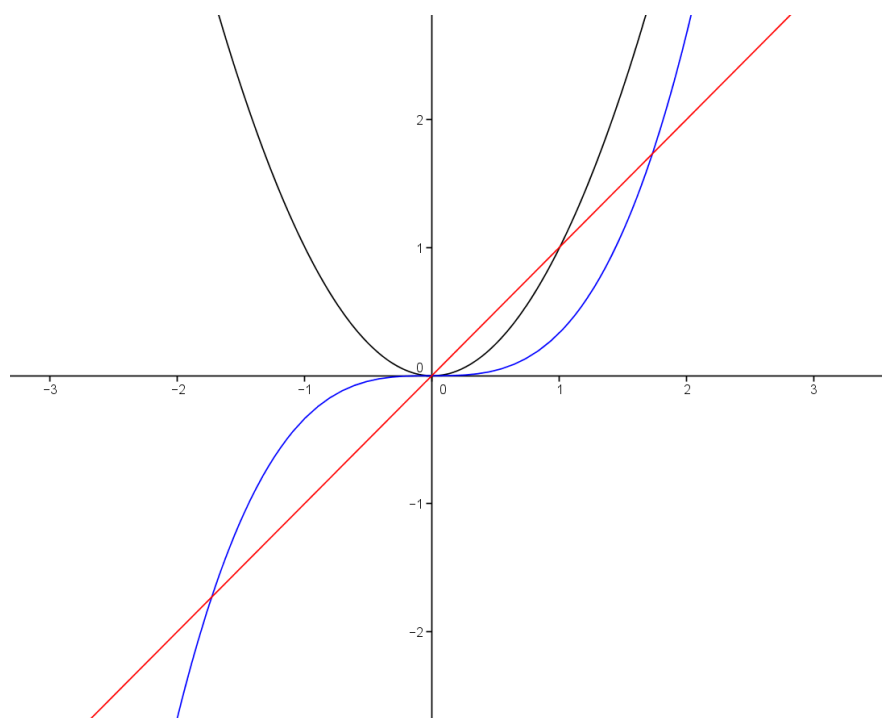


2 UNIT MATHEMATICS

Curve Sketching Instructions

Rules for curve sketching:

- Differentiating: gradient becomes the y-value
- Integrating: y-value becomes the gradient



- The parabola $y = x^2$ is the original function
 - The line $y = x$ is the derivative
 - The cubic $f(x) = 1/3 x^3$ is the integral

Differentiating:

- If the function is sloping upwards (increasing y-value, gradient is positive), then the derivative is above the x-axis.
- If the function is sloping downwards (decreasing y-value, gradient is negative), then the derivative is below the x-axis.
- If the function is at a stationary point (y-value is unchanging, gradient = 0), then the derivative is an x-intercept.
 - If the function is a horizontal point of inflexion, the derivative is a maximum or minimum that touches the x-axis at its peak.
- If the function has a spike, then the derivative is undefined (it is discontinuous and should be represented by as open circle)

Integrating:

- The original curve's y-values are the primitive's gradients
 - If the y-value is positive (above the x-axis), the gradient of the primitive is positive
 - If the y-value is negative (below the x-axis), the gradient of the primitive is negative
 - If the y-value = 0 (on the x-axis), the primitive curve has a maximum or minimum turning point or a horizontal point or inflexion
 - Note: If the curve approaches a value of 1 at infinity, the primitive approaches a gradient of 1 at infinity, so a horizontal asymptote is created at this point with a gradient of 1 (the asymptote has this gradient but the primitive function never reaches it). The gradient of the asymptote in this situation would be $y=x$, though other situations can exist.
 - If it passes through the x-axis from positive to negative, then the primitive is maximum at that point
 - If it passes the x-axis from negative to positive, it is a minimum at that point
 - If it is a maximum or minimum that touches the x-axis at its peak, then it is a horizontal point of inflection
 - If there is a discontinuous point in the original function, then the primitive will also have a discontinuous point or a spike
- **Note:** When drawing it is helpful to divide the curve into vertical strips with a demarcation through each intercept, stationary point, inflexion point and extrema