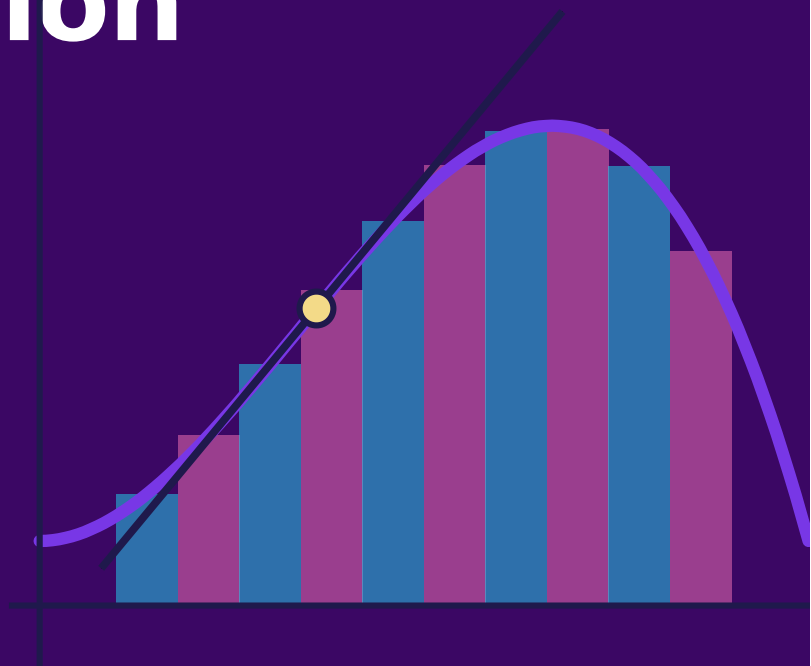


Differentiation

**First principles** **B**

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

Standard

$$(x^n)' = nx^{n-1}, \quad (e^{kx})' = ke^{kx}, \quad (\ln x)' = \frac{1}{x},$$

$$(\sin kx)' = k \cos kx, \quad (\cos kx)' = -k \sin kx$$

Exponential base a

$$(a^{kx})' = ka^{kx} \ln a$$

Trig **B**

$$(\tan kx)' = k \sec^2 kx, \quad (\sec kx)' = k \sec kx \tan kx,$$

$$(\cot kx)' = -k \operatorname{cosec}^2 kx, \quad (\operatorname{cosec} kx)' = -k \operatorname{cosec} kx \cot kx$$

Product; chain

$$(uv)' = uv' + vu', \quad \frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

Quotient **B**

$$\frac{d}{dx} \left(\frac{f}{g} \right) = \frac{f'g - fg'}{g^2}$$

Inverse; parametric

$$\frac{dy}{dx} = \frac{1}{dx/dy}; \quad \frac{dy}{dx} = \frac{dy/dt}{dx/dt}$$

Implicit

$$\frac{d}{dx} f(y) = f'(y) \frac{dy}{dx}, \quad \frac{d}{dx} (xy) = x \frac{dy}{dx} + y$$

B given in the exam. Learn the rest.