

Lecture 39: Checklists

This checklist complements the previous checklists for the midterms.

Integrals to know well

<input type="checkbox"/>	$\sin(x)$
<input type="checkbox"/>	$\cos(x)$
<input type="checkbox"/>	$\tan(x)$
<input type="checkbox"/>	$\log(x)$
<input type="checkbox"/>	$\exp(x)$
<input type="checkbox"/>	$1/x$
<input type="checkbox"/>	x^n
<input type="checkbox"/>	$1/\cos^2(x)$
<input type="checkbox"/>	$1/\sin^2(x)$
<input type="checkbox"/>	$1/(1+x^2)$
<input type="checkbox"/>	$1/(1-x^2)$
<input type="checkbox"/>	$1/\sqrt{1-x^2}$

Applications you have to know

Since there are few questions on what has to be known about applications and definitions (this list only covers application parts):

<input type="checkbox"/>	Derivative: Limit of differences $D_h f = [f(x+h) - f(x)]/h$ for $h \rightarrow 0$
<input type="checkbox"/>	Integral: Limit of Riemann sums $S_h f = [f(0) + f(h) + \dots + f(kh)]h$.
<input type="checkbox"/>	Newton step: $T(x) = x - f(x)/f'(x)$.
<input type="checkbox"/>	Marginal cost: the derivative F' of the total cost F .
<input type="checkbox"/>	Average cost: F/x where F is the total cost.
<input type="checkbox"/>	Velocity: Derivative of the position.
<input type="checkbox"/>	Acceleration: Derivative of the velocity.
<input type="checkbox"/>	Curvature: $f''(x)/(1+f'(x)^2)^{3/2}$.
<input type="checkbox"/>	Probability distribution function: nonnegative function with total $\int f(x)dx = 1$.
<input type="checkbox"/>	Cumulative distribution function: anti-derivative of the probability distribution function.
<input type="checkbox"/>	Expectation: $\int xf(x) dx$, where f is the probability density function.
<input type="checkbox"/>	Piano function: frequencies $f(k) = 440 \cdot 2^{k/12}$ for integer k .
<input type="checkbox"/>	Hull function: The interpolation of local maxima.
<input type="checkbox"/>	Catastrophe: A parameter c at which a local minimum disappears.

Core concepts

<input type="checkbox"/>	Fundamental: The fundamental theorem of calculus
<input type="checkbox"/>	Extrema: Second derivative test
<input type="checkbox"/>	Derivatives: slope rate of change
<input type="checkbox"/>	Integrals: area, volume
<input type="checkbox"/>	Limits: Hôpital!
<input type="checkbox"/>	Continuity: know the enemies of continuity
<input type="checkbox"/>	Numerics: Riemann sum, Trapezoid and Simpson rule
<input type="checkbox"/>	Rules: Differentiation and integration rules.
<input type="checkbox"/>	Methods: Integration by parts, Substitution, Partial fraction.

Not needed on your fingertips

The following concepts have appeared but do not need to be learned by heart:

<input type="checkbox"/>	Entropy: $-\int f(x) \log(f(x)) dx$.
<input type="checkbox"/>	Moment of inertia: $\int x^2 f(x) dx$.
<input type="checkbox"/>	Monte Carlo integration: $S_n = \frac{1}{n} \sum_{k=1}^n f(x_k)$, where x_k are random in $[a, b]$.
<input type="checkbox"/>	Weierstrass function: A function which is continuous but nowhere differentiable.
<input type="checkbox"/>	Bart Simpson rule: $S_n = \frac{1}{6n} \sum_{k=1}^n [f(x_k) + 4f(y_k) + f(x_{k+1})]$.
<input type="checkbox"/>	Chaikin step: $R_{2i} = \frac{3}{4}P_i + \frac{1}{4}P_{i+1}$, $R_{2i+1} = \frac{1}{4}P_i + \frac{3}{4}P_{i+1}$.
<input type="checkbox"/>	Cocktail party stuff: Eat, integrate and love, the story of exp in practice exam 2.
<input type="checkbox"/>	Bottles: How to calibrate bottles. The calibration formula.
<input type="checkbox"/>	Sofia: The name of a calculus bot once roaming the math department.
<input type="checkbox"/>	Wobbly chair: One can turn a chair on any lawn to stop it from wobbling.
<input type="checkbox"/>	Warthog: "Tuk", the name of the warthog which appears in practice exams.