



# K L UNIVERSITY

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## Model Questions for Entrance Test for PhD Admissions Department of Mathematics

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- The sequence  $(\sin n)$  is
  - Monotone
  - Bounded but not convergent
  - Converges to zero
  - Not bounded
- The sequence  $\left\{ \frac{n^\alpha}{(1+n)^p} \right\}$  is convergent if  $\alpha$  is real and
  - $|p| > \alpha$
  - $0 < p < 1$
  - $p > 0$
  - $\alpha < 0$  and  $p$  any real number
- The infinite series  $\sum_{n=1}^{\infty} a_n$  where  $a_{2n} = 0$  and  $a_{2n-1} = 1/(2n-1)$ 
  - $|p| > 1$
  - $p \leq 1$
  - $p > 1$
  - $p < 0$
- The function  $f(x) = x^2$  is not uniformly continuous on
  - $[-1, 1]$
  - $(-2, 2)$
  - $(1, 2]$
  - $(0, \infty)$
- Example of  $f: \mathbb{R} \rightarrow \mathbb{R}$  with  $f(0) = 0$  where is differentiable but the derivative is not continuous
  - $x \sin\left(\frac{1}{x}\right)$  ( $x \neq 0$ )
  - $x^2 \sin\left(\frac{1}{x}\right)$  ( $x \neq 0$ )
  - $x \sin\left(\frac{1}{x^2}\right)$  ( $x \neq 0$ )
  - $\sin\left(\frac{1}{x}\right)$  ( $x \neq 0$ )
- $\int_{-3}^2 f(x) dx =$ 
  - 0
  - +1
  - 2
  - 3
- The area of the region bounded by the curve  $f$  defined on  $[-1, 1]$  by  $f(x) = |x|^3$  is
  - 0
  - 1/2
  - 2
  - 3
- The Jacobian at  $(0, 0, 0)$  for  $f(x, y, z) = (\sin x, \sin y, \sin z)$  is
  - 0
  - 1
  - 1
  - $\sin x \sin y \sin z$