

Mini-test for Derivatives and Ch 6.1*Math 104, Spring 2009*

You must show your work. No credit is given if no supporting work is shown. No partial credit is given.

1. The function $y = x^x$ is defined for $x > 0$. If x is close to 0 then the value of x^x is close to 1. In fact,

$$\lim_{x \rightarrow 0^+} x^x = 1.$$

Also, if $x = 1$ then $x^x = 1$. In between, i.e. for $0 < x < 1$, the value of x^x is less than 1. What is the minimum value of the function $y = x^x$?

Hint: Write $x = e^{\ln x}$, and then $x^x = (e^{\ln x})^x = \dots$

- A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{2}}$ C) $\frac{1}{\ln 2}$ D) $\frac{1}{e^e}$ E) $\frac{1}{\sqrt[e]{e}}$ F) $\frac{1}{\pi^\pi}$

2. Find the total area of the region bounded by the graphs of

$$y = x^3 + x^2 - x, \text{ and } y = x^2.$$

- A) 0 B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{2}$ E) $\frac{2}{3}$ F) $\frac{3}{4}$

3. Find the total area of the region bounded by the x -axis, the parabola $y = x^2$, and the tangent line to the parabola at the point $(2, 4)$.

- A) $1/12$ B) $1/3$ C) $1/4$ D) $1/2$ E) $2/3$ F) $3/4$