

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation when appropriate). Indicate where technology is used and what type (Maple, GC). Note: all antiderivatives and derivatives may be performed with technology.

1. Find the arclength L of the curve segment $y = 4(x - 1)^{\frac{3}{2}}$, $1 \leq x \leq 2$ exactly and to 3 decimal places, showing all steps by hand. Compare your result to the secant line segment length between the left and right endpoints. Does this seem right? Explain.

2. Consider the function $f(x) = kx^2$ on the interval $0 \leq x \leq \frac{1}{2}$. Do all integrals by hand (but check with technology).

a) Determine the value of the coefficient which makes this a probability distribution on this interval.

b) Evaluate the expected value μ of the random variable described by this distribution.

c) Solve the condition $P(0 \leq x \leq X) = \frac{1}{2}$ by hand for the median value X of this distribution.

d) Make a rough sketch of a plot of this distribution on its interval and mark (and identify) the expected value and median values on the horizontal axis extended upwards to the curve by a vertical line segment. Gridlines make it easier to sketch.

3. Use a limit to evaluate the following improper integral exactly and numerically to 5 decimal places:

$$\int_1^{\infty} \frac{\arctan(x)}{x^3} dx . \text{ [Use technology to get the antiderivative and recall the value of } \lim_{x \rightarrow \infty} (\arctan(x)) \text{ or use}$$

technology to evaluate this arctan limit which appears in your expression.]

► solution

▼ pledge

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet in on top of your answer sheets as a cover page, with the first test page facing up:

"During this examination, all work has been my own. I give my word that I have not resorted to any ethically questionable means of improving my grade or anyone else's on this examination and that I have not discussed this exam with anyone other than my instructor, nor will I until after the exam period is terminated for all participants."

Signature:

Date: