

# Math 105

## Practice Midterm 2 for Midterm 2

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*This practice midterm may be harder and/or longer than the real midterm.*

*Not all question will be worth the same number of points.*

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1. Find the area of the region in the first quadrant that is bounded above by  $y = \sqrt{x}$  and below by the  $x$ -axis and the line  $y = x - 2$ .
  2. A bank account has \$20,000 earning 5% interest compounded continuously. A pensioner uses the account to pay himself an annuity, drawing continuously at a \$2000 annual rate. How long will it take for the the balance in the account to drop to zero?
  3. Sketch the  $xy$ -trace,  $xz$ -trace, and  $yz$ -trace of the surface  $z = 4y^2 - 9x^2$ .
  4. Evaluate the limit  $\lim_{(x,y) \rightarrow (4,1)} \frac{x^2 - 4xy^4}{\sqrt{x} - 2y^2}$ , or show that it doesn't exist.
  5. Consider the function  $f(x, y) = x^2 - 3y^2$ .
    - (a) Calculate  $f_x$  and  $f_y$ .
    - (b) Find the rate of maximum increase when  $x = 3$ ,  $y = 2$ .
    - (c) Sketch the level curve at height  $z = 4$ . Find the slope  $\frac{dy}{dx}$  of the tangent line to this level curve at  $(x, y) = (4, 2)$ .
  6. Find the linear approximation for  $\sqrt{(3.06)^2 + (3.92)^2}$ .
  7. Find the critical points of  $f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy$ , and classify each one as a maximum, minimum or saddle point.
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