

## EXAM 3 - MATH 112

DATE: Friday, March 18

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Determine the equation of the tangent line to the graph of  $f(x) = (e^{2x} + 1)^3$  at the point  $x = 0$ .
2. Study the function  $f(x) = x^2e^{-x}$ . (Find intervals of monotonicity, relative extrema, intervals of concavity, inflection points, and roughly sketch the graph.) In your study, you may find the following numbers useful  $e^{-2} \approx 0.14$ ,  $f(2 + \sqrt{2}) \approx 0.385$  and  $f(2 - \sqrt{2}) = 0.2$ .
3. You deposit  $P$  dollars in an account whose annual interest rate is  $r$ , compounded continuously. How long will it take for your balance to quintuple (become 5 times your deposit)? Recall that the future amount for continuous compounding is given by  $A = Pe^{rt}$ .
4. Find the second derivatives of the functions:
  - (a)  $f(x) = \log_2(3x + 7)$
  - (b)  $f(x) = x \ln \sqrt{x} + 2x$
5. Compute the following indefinite integrals:
  - (a)  $\int (\sqrt[5]{x^3} + \frac{t^2+2}{t^2})dx$
  - (b)  $\int x^2(\sqrt{x} + \sqrt[5]{x^7})dx$
6. A ball is thrown upward with an initial velocity of 16 feet per second from an initial height of 32 feet. Derive the position function  $s(t)$  of the height  $s$  in terms of time  $t$ . Then find when the ball will hit the ground. Given is the acceleration due to gravity  $\alpha = -32$  feet/second.