

# PRACTICE EXAM 4 - MATH 151

DATE: Monday, December 3

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Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

**GOOD LUCK!!**

- Find the local and the absolute minima and maxima of the following functions in the indicated interval:
  - $f(x) = x - \sqrt{x}$ ,  $[0, 4]$  (2.5 points)
  - $f(x) = \frac{x}{x^2+x+1}$ ,  $[-2, 0]$  (2.5 points)
- Find the domain, the  $y$ -intercept, the asymptotes, (1 point) form the sign table (2 points) and roughly sketch the graph (2 points) of the function  $f(x) = x^3 - 6x^2 - 15x + 4$
- Find the domain, the  $x$ - and  $y$ -intercepts, the asymptotes, (1 point) form the sign table (2 points) and roughly sketch the graph (2 points) of the function  $f(x) = \frac{1}{x} + \frac{1}{x+1}$ .
- Suppose that  $f$  is continuous on  $[0, 4]$ ,  $f(0) = 1$  and  $2 \leq f'(x) \leq 5$  for all  $x$  in  $(0, 4)$ . Show that  $9 \leq f(4) \leq 21$ . (3 points)
  - For what values of the constants  $a$  and  $b$  is  $(1, 6)$  a point of inflection of the curve  $y = x^3 + ax^2 + bx + 1$ ? (2 points)
- Find the point on the hyperbola  $xy = 8$  that is closest to the point  $(3, 0)$ . (5 points)
- Find the most general antiderivative of the function  $f(x) = e^x - \frac{2}{\sqrt{x}}$ . (2 points)
  - A particle is moving with  $a(t) = \cos t + \sin t$ ,  $s(0) = 0$ ,  $v(0) = 5$ . Find the position function  $s = s(t)$  of the particle with respect to time. (3 points)