

# Final Exam

Saturday, August 76, 2038

# MATH 151

11:00 – 1:00 Founders 4004

**Instructions: Show all work.** Failure to show work may result in loss of credit. Write your solutions in the space provided on the *answer sheets*. Do not hand in scratch paper. You may use your graphing calculators for all questions, but decimal approximations are acceptable only in *Question 10*. A one-page list of relevant formulae is also allowed. Please remember to circle your final answers. Some partial credit *may* be given. **Good Luck!**

- 1) Find the exact value of  $\tan\left(2\sin^{-1}(1/3)\right)$ .
- 2) Find  $\lim_{x \rightarrow \infty} \left(\sqrt{2x+1} - \sqrt{2x-1}\right)$ .
- 3) Find all asymptotes of the curve  $y = \frac{x^2 - 12x + 10}{8x^2 + 5x - 11}$ . Do not graph.
- 4) Differentiate the function  $y = (x+1)^{2x}$ .
- 5) Find an equation of the tangent line to the curve  $e^y + y = x$  at the point  $(1, 0)$ .
- 6) If  $y = \sin(e^{3x} + x)$  find  $\frac{dy}{dx}$ .
- 7) Find the minima and maxima of the function  $f(x) = (2x^2 + x + 2)e^{-x}$  on the interval  $[0, 2]$ .
- 8) Find the points on the curve  $6x^2 + 12xy + y^2 = 130$  that are closest to the origin.
- 9) Sketch the graph of  $g(x) = \sin(3x) + 3\sin x$ . Use the guidelines in your book. Any conclusions based solely on graphing utilities or computers are not acceptable.
- 10) Use Newton's method to find the root of the equation  $x^5 + 3x - 3 = 0$  correct to four decimal places. Use  $x_0 = 1$  as the initial approximation.
- 11) Find the most general antiderivative of the function  $f(x) = \frac{4x-11}{5x^3} + 2$ .
- 12) Find  $g$  if  $g''(x) = 20x^3 + 12x$ ,  $g'(0) = 4$ ,  $g(0) = 3$ .

**Points:** There are twelve questions; question  $\#n$  is worth  $\frac{50 - 2\cos(2n\pi/3)}{3}$  points.

You are welcome to keep this *Questions sheet* for your files.