Review Final
Math 1113

Name
Id
Section

Read each problem carefully. Show all your work. Credits will be given mainly depending on your work, not just an answer. Avoid simple mistakes! Put a box around the final answer to a question. Use the back of the page if necessary.

(1) Solve the following equations.
   a) $3x^2 - 7x - 4 = 0$ by completing the square.
   b) $x^2 + x + 1 = 0$
   c) $-x^3 + 2x^2 + 3x - 6 = 0$

(2) Solve the system by the substitution or elimination method. Show all steps and describe in your own words what you are doing at each step.

   a)

$$\begin{cases} 2x + y = 18 \\ x - 2y = 6 \end{cases}$$

   b)

$$\begin{cases} 2x + 2y - 2z = 10 \\ 2x + 4y + 8z = -8 \\ 10x + 10y - 2z = -6 \end{cases}$$

(3) Sketch the graphs for the following functions.
   a) $f(x) = x^2 + x + 1$. (Indicate vertex and intercept(s))
   b) $g(x) = 2^x - 3$ (Indicate asymptote)
   c) $h(x) = 3\sin 2x$ (Indicate period and amplitude)

(4) Find the exact value of
   a) $\log_5(125) - 3\ln(e^4)$
   b) $\sin 15^\circ$
   c) $\frac{\cos 15^\circ}{\sin 75^\circ}$
   d) $\sin(\frac{5\pi}{7}) - \sin(\frac{2\pi}{7})$
   e) $\tan\frac{\pi}{8}$
   f) $\cot 18^\circ \tan 18^\circ$

(5) Solve the following equations.
   a) $\frac{2}{x} = \frac{3}{x-2} - 1$
   b) $\sqrt{2x+6} - \sqrt{x+4} = 1$
   c) $2\cos x = -1$
   d) $e^{2x} - 3e^x + 2 = 0$
   e) $\ln(x-2) + \ln(2x-3) = 2\ln x$

(6) Show the identities.
   a) $\cos 2x = 2\cos^2 x - 1$ (Hint: $\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$)
   b) $\frac{1-\sin x}{1+\sin x} = (\sec x - \tan x)^2$

(7) Solve the triangle $\triangle ABC$. State the case and the Law first.
   - $a = 10, b = 6, B = 15°$.
   - $a = \sqrt{17}, b = \sqrt{17}, C = 60°$.
   - $a = 22, B = 36°, A = 72°$.

(8) Two ships leave a port at 12 noon one travels with a bearing $N53°W$ at 10 miles per hour, the other ship travels with a bearing of $S67°W$ at 20 miles per hour. How far apart are the ships at 3PM? (Hint: Draw the picture).

(9) Use point plotting and/or parameter elimination method to graph the plane curve described by the given parametric equations. Use arrow to show the orientation of the curve corresponding increasing values of t.
   a) $x = 4\sin t + 2, y = 4\cos t - 1$, $\pi/2 \le t \le 3\pi/2$
   b) $x = t^2, y = t^3$, $-\infty < t < \infty$ (Section 10.5#17)
   c*) [Bonus] $x = 3(t - \sin t), y = 3(1 - \cos t)$, $0 \le t < 2\pi$ (Hint: The cycloid which is traced out by a fixed point on a wheel of radius $R = 3$ rolling along a horizontal line).