Instructions:

Work out as much of this exam as you can; don’t worry about time. Work carefully, writing out your work and stating your answers clearly, just as if this was an ordinary (not self-placement) exam. Do not look at the answers until you are finished. Do not use a calculator or other technological aid.

1. Solve for $y$: $2y^2 - 3y - 2 = 0$
2. Solve for $x$: $\sqrt{6x + 7} = x + 2$
3. Solve for $x$: $-5 < \frac{1}{2}(3x + 1) \leq 7$
4. Solve for $x$: $|2x + 3| < 13$
5. Which of the following are graphs of functions?

6. Let $f(x) = 5x^2 + 4x$. Evaluate each of the following:
   
   (a) $f(0)$; (b) $f(3)$; (c) $f(-1)$; (d) $f(t)$; (e) $f(t - 1)$; (f) $\frac{f(a + h) - f(a)}{h}$

7. Find the $x$- and $y$-intercepts of $y = (x - 2)^2(x + 2)(x + 4)$.

8. Factor $x^3 + 4x^2 - 12x$ as completely as possible.

9. Let $A$ be the point $(-2, 1)$, let $B$ be the point $(2, 3)$, and let $C$ be the point $(3, 1)$. First plot these points and draw the triangle $ABC$. Then use the distance formula to find the lengths of the three sides of the right triangle $ABC$. Finally, verify that the Pythagorean Theorem works for this triangle.
10. Match each equation with its graph:
   (a) $y = -2x^2 + 3x + 1$;  (b) $y = \frac{1}{2}e^{-x} - 1$;  (c) $y = \log_5 x$;  (d) $y = 1 - \sin x$

11. Find the vertical and horizontal asymptotes of $y = \frac{3x + 5}{x - 6}$.

12. Solve for $x$: $e^{2x} = 8$

13. Solve for $x$: $2^{3x-4} = 5$

14. Solve for $x$: $\log_2(3x - 4) = 5$

15. Solve for $x$: $\ln x + \ln(x + 3) = 1$

16. Convert the radian angle measures $\frac{5\pi}{4}$, $\frac{5\pi}{6}$, and $-\frac{5\pi}{2}$ to degree measures.

17. Find the exact value of $\tan(4\pi/3) + \cos(4\pi/3)$ without using a calculator.

18. Below are the graphs of the six basic trigonometric functions. Which graph represents which function?

19. Let $\theta$ be the angle between the $x$-axis and a segment joining the origin to $(-3, 4)$. Find $\sin \theta$.

20. Verify that $\csc \theta - \cot \theta = \frac{\sin \theta}{1 + \cos \theta}$. (Hint: Write everything in terms of $\sin \theta$ and $\cos \theta$ first.)