NAME: _____

Instructions: The exam questions are closely related to the homework and to the examples shown in class. Make sure you review your WeBWorK assignments. For more practice you are strongly encouraged to do the suggested homework from the textbook.
Solutions will be posted: https://openlab.citytech.cuny.edu/groups/mat-1375-f18-ghezzi/

1. Given $y = 2\sin(3x - \pi)$, state the amplitude, period and phase shift, and then sketch one complete cycle of the graph. Label all maxima, minima and x-intercepts.

2. Given $y = -5\cos(x + \frac{\pi}{2})$, state the amplitude, period and phase shift, and then sketch one complete cycle of the graph. Label all maxima, minima and x-intercepts.

3. Condense the following expression into a single logarithm by applying the properties of logarithms: $-2\log x + \frac{1}{2}\log y - 4\log z$.

4. The population of a country grows exponentially at a rate of 1% per year. If the population was 35.7 million in the year 2010, then what is the population size of this country in the year 2015? (Round your answer to one decimal.) In what year will the population be double?

5. Studies show that the minimum half-life of Methotrexate is 3 hours.

   a) Construct a function that will model the minimum amount of Methotrexate left in the body after an initial dose of 45 mg. [Hint: use the model $Q(t) = Pe^{rt}$, where $Q(t)$ describes the amount of Methotrexate left in the body after t hours following an initial dose of P mg.]

   b) How long (in hours) will it take for the amount of Methotrexate left in the body to reach 7 mg? (Round your answer to two decimals.)

6. Solve the equation $\log_3(x) + \log_3(x - 8) = 2$.

7. Find the domain, asymptotes, and x-intercepts of the function $f(x) = -\log(3 - 2x)$. Sketch its graph.

8. Let $u = \ln x$, $v = \ln y$, $w = \ln z$, where $x, y, z > 0$. Write the expression $\ln\sqrt{\dfrac{xy^3}{\sqrt{z}}}$ in terms of u, v and w.

9. Given that $\tan(\alpha) = -5/12$ and α is in quadrant 2, find the exact values of $\sin(2\alpha)$ and $\cos(2\alpha)$.

10. Find all exact solutions in radians.
    a) $\tan(x) = \sqrt{3}/3$
    b) $\cos(x) = -1$
    c) $\sin(x) = -\sqrt{3}/2$
    d) $2\cos^2(x) = \cos(x)$
    e) $2\sin^2(x) + \sin(x) - 1 = 0$

11. Given that α is in quadrant 3 and $\cos(\alpha) = -2/9$, and also given that β is in quadrant 1 and $\sin(\beta) = 5/6$, give an exact answer for $\cos(\alpha - \beta)$.