Final Exam Practice

1. Let's say we are given the function $s(t) = t^{\sin(t)} - 4$. Use your calculator to answer the following questions.

a) On the interval [0, 10], when does s(t) have a relative maximum?

t=2.128

t=7.915

b) On the interval [0, 10], when does s(t) have a relative a minimum?

t=0.352

t=4.843

c) On the interval [0, 10], at which of the following times does s(t) have zeroes? Select all that apply.

A. t=0 B. t=1.707 C. 4.843 D. 7.071 E. 8.731

d)What does the table for this function look like at the following t-values?

t	s(t)
0	Error
1	-3
2	-2.122
3	-2.832
4	-3.65

e) On the interval [0, 10], when does |s(t)|=1? Select all that apply

A. 6.889 B. 7.233 C. 8.578 D. 8.023 E. 8.898

2. At what points do the graphs of $f(x) = 2\cos(x) + \sin(x)$ and $g(x) = 4\cos(x)$ intersect on the interval [0, 10]? Select all that apply.

A. (0, 2) B. (1.107, 1.789) C. (4.249, -1.789) D. (7.39, 1.789) E. (8.318, 0)

3. A particle moves along the x-axis so that its velocity for [0,9] is given by $v(t) = 4\cos^2(t) - t$. Consider only the interval [0, 6].

a) At t=1, is the particle moving to the right, left, or neither? Justify your answer.

At t=1, the particle is moving right because v(1) is positive.

b) On which of the following intervals is the acceleration positive? Select only one.

A. (0, 1.697) B. (1.697, 3.015) C. (3.015, 3.502) D. (3.502, 4.839) E. (4, 4.5)

c) On what intervals from [0, 6] is the velocity of the particle positive? Justify your answer.

Velocity is positive when the graph of v(t) is above the t-axis.

(0, 1.037), (2.476, 3.502)

d) On what ~~interval~~(s) is the particle at rest on the interval [0, 6]? Justify your answer.

At what times

At t= 1.037, 2.476, and 3.502 the particle is at rest b/c v(t) is 0.

f) At what times on [0, 6] is the acceleration of the particle zero? Justify your answer.

At t= 1.697, 3.015, and 4.839 the acceleration is zero b/c v(t) is neither increasing nor decreasing.

4. For a period of time, the value of a certain stock market followed the model $V = Ce^{kt}$ where C and k are both constants. If the value (V) of the market doubled every 6 years, what are the two constants?

$(0,1)$ $(6,2)$

$1 = Ce^{k(0)}$

$1 = Ce^0$

$\boxed{C=1}$

$V = e^{kt}$ $(6,2)$

$2 = e^{k(6)}$

$\ln(2) = 6k$

$\boxed{\frac{\ln(2)}{6} = k}$

5. The decay of a specific isotope can be modeled by the function $A = 60e^{-kt}$ where k is a constant. A is measured in kilograms and t is measured in years. When t=40 years, there was 20kg of isotope remaining. What is the value of k?

$(40,20)$

$20 = 60e^{-k(40)}$

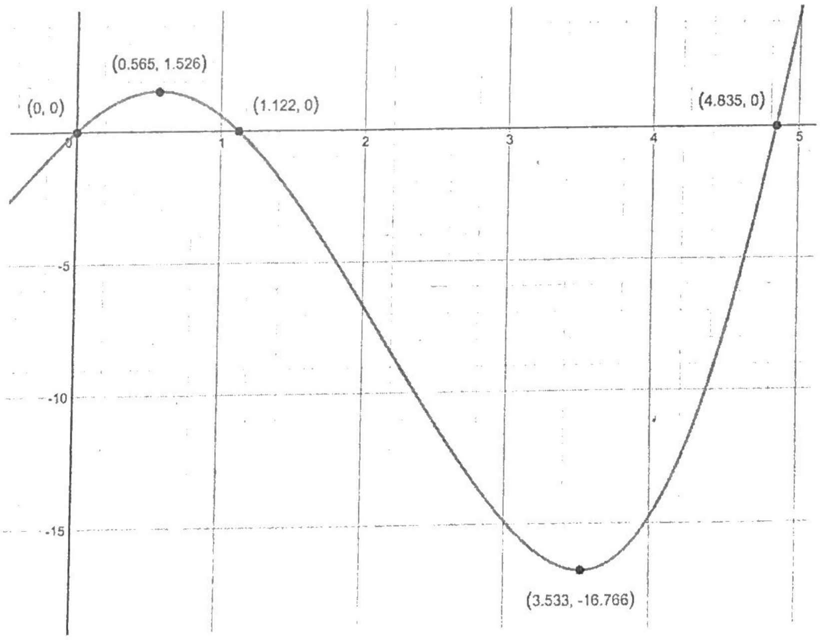
$\frac{1}{3} = e^{-k(40)}$

$\ln(\frac{1}{3}) = -40k$

$\boxed{\frac{\ln(\frac{1}{3})}{-40} = k}$

6. Using the graph of the position of a particle p(t) below, at what times is particle at the origin? Select all that apply.

A. t=0
B. t=0.565
C. t=1.122
D. t=3.533
E. t=4.835



7. Simplify the following the logarithmic expression to a single logarithm.

a. $\log_2(x) + 3\log_2(y)$

$\log_2(xy^3)$

b. $2\log_a(x) - 3\log_a(y)$

$\log_a\left(\frac{x^2}{y^3}\right)$

c. $4\,[\log_3(x) + \log_3(y)]$

$4\log_3(xy)$

$\log_3(x^4y^4)$

OR

$4\log_3(x) + 4\log_3(y)$

$\log_3(x^4) + \log_3(y^4)$

$\log_3(x^4y^4)$

d. $\frac{1}{2}\log_2(x) + 3\log_2(y) - \log_2(6)$

$\log_2(\sqrt{x}) + \log_2(y^3) - \log_2(6)$

$\log_2\left(\frac{\sqrt{x}\,y^3}{6}\right)$

8. If $f(x) = e^{4x+2} - 3$, what is the zero of f(x)?

$0 = e^{4x+2} - 3$

$3 = e^{4x+2}$

$\ln(3) = 4x+2$

$\ln(3) - 2 = 4x$

$\frac{\ln(3)-2}{4} = x$

9. A. If $y = \sin\left(\frac{\pi}{2}x\right)$, find the zeroes on the interval $[0, 2\pi]$.

$0 = \sin\left(\frac{\pi}{2}x\right)$ $\quad \frac{\pi}{2}x = 0 + 2\pi n$ $\quad \frac{\pi}{2}x = \pi + 2\pi n$

$\sin^{-1}(0) = \frac{\pi}{2}x$ $\quad x = \frac{2}{\pi}(0 + 2\pi n)$ $\quad x = \frac{2}{\pi}(\pi + 2\pi n)$

$x = 4n$ $\quad n=0$ $\quad x = 2 + 4n$

$x = 0$ $\quad n=1$ $\quad x = 2$

$x = 4$ $\quad x = 6$

10. A. If $y = \cos\left(\frac{\pi}{8}x\right)$, find the zeroes on the interval $[0, 2\pi]$.

$0 = \cos\left(\frac{\pi}{8}x\right)$ $\quad \frac{\pi}{8}x = \frac{\pi}{2} + 2\pi n$ $\quad \frac{\pi}{8}x = \frac{3\pi}{2} + 2\pi n$

$\cos^{-1}(0) = \frac{\pi}{8}x$ $\quad x = 4 + 16n$ $\quad n=0$ $\quad x = 12 + 16n$

$\boxed{x = 4}$ $\quad \cancel{x = 12}$

11. A. If $y = \sin(2\pi x)$, find the zeroes on the interval $[0, 2\pi]$.

$0 = \sin(2\pi x)$ $\quad 2\pi x = 0 + 2\pi n$ $\quad 2\pi x = \pi + 2\pi n$

$\sin^{-1}(0) = 2\pi x$ $\quad x = n$ $\quad n=0$ $\quad x = \frac{1}{2} + n$

$x = 0$ $\quad n=1$ $\quad x = \frac{1}{2}$

$x = 1$ $\quad n=2$ etc... $\quad x = \frac{3}{2}$

$x = 2$ $\quad x = \frac{5}{2}$

$x = 3, x = 4, x = 5, x = 6$ $\quad x = \frac{7}{2}, \frac{9}{2}, \frac{11}{2}, \cancel{\frac{13}{2}}$ too big

12. A. If $y = \cos(\pi x)$, find the zeroes on the interval $[0, 2\pi]$.

$0 = \cos(\pi x)$ $\quad \pi x = \frac{\pi}{2} + 2\pi n$ $\quad \pi x = \frac{3\pi}{2} + 2\pi n$

$\cos^{-1}(0) = \pi x$ $\quad x = \frac{1}{2} + 2n$ $\quad n=0$ $\quad x = \frac{3}{2} + 2n$

$x = \frac{1}{2}$ $\quad n=1$ $\quad x = \frac{3}{2}$

$x = \frac{5}{2}$ $\quad n=2$ $\quad x = \frac{7}{2}$

$x = \frac{9}{2}$ $\quad x = \frac{11}{2}$

Evaluate the following Trig Expressions. Rationalize every denominator.

$\sec(\pi/3) = 2$

$\csc^2(\pi/4) = 2$

$\cot(\pi/6) = \sqrt{3}$

$\sec(\pi/4) = \sqrt{2}$

$\csc(\pi/3) = \frac{2\sqrt{3}}{3}$

$\cot(\pi/2) = 0$

$\sec^2(\pi/6) = \frac{4}{3}$

$\csc^2(\pi/6) = 4$

$\cot^2(0) =$ undef

$\sec(0) = 1$

$\csc(\pi/2) = 1$

$\cot(\pi/4) = 1$

$\sec^2(\pi/2) =$ undef

$\csc^2(0) =$ undef

$\cot^2(\pi/3) = \frac{1}{3}$