

(The 40 Question- Project ( 100 points, 2.5 points per question)

(100% of the total grade)

- Students will work on the project from May 18<sup>th</sup> until June 11<sup>th</sup> 2020.
- Students will work on several questions per live meeting and I will be coaching them to get to the correct answer.
- Students will be instructed to take a photo of their work and answers of the questions we work during live meeting and email or text them to me the next day.

## A 40- Question Project

1. A total of \$1,000 is invested at 10%, compounded monthly for five years. What is the balance after five years? What is the effective rate?

$$f(x) = e^{6-x} + 2$$

2. Find the inverse of the function  $f(x) = e^{6-x} + 2$ . If the domain needs to be restricted to find the inverse state the restricted domain. If the domain does not need to be restricted to find the inverse, explain.

3. Find the exact solution for  $x$  in the equation

$$\ln(x - 10) + \ln(x - 2) = 0.$$

4. What is the domain of the function

$$f(x) = \ln(x^2 - 9x + 20)?$$

5. Write

$$\frac{1}{2} \log_8(x) - 3 \log_8(x + 1)$$

As one term.

6. Find the exact value of

$$9 \log_6 \sqrt[3]{36}.$$

7. Find the exact solution(s) to the equation

$$e^{2x} - e^x - 30 = 0.$$

8. Find the exact solution(s) to the equation

$$\ln(x - 2) + \ln(2x - 3) = 2 \ln(x).$$

9. Which balance is largest after five years?
- \$1,000 invested at 10% compounded continuously
  - \$1,000 invested at 10.3% compounded monthly
  - \$1,000 invested at 10.1% compounded weekly

10. On a college campus of 5,000 students, one student returned from vacation with a contagious flu virus. The spread of the virus through the student body is given by

$$y = \frac{5000}{1 + 4999e^{-0.8t}}$$

Where  $y$  is the total number of students infected after  $t$  days. The college will cancel classes when 40% or more of the students are ill. After how many days will the college cancel classes?

11. What is the exact maximum value of the function?

$$f(x) = -2x^2 - 16x + 7?$$

12. Given  $f(x) = 7x^2 - 3$ , and  $g(x) = 1 - 2x$ , find  $f(g(x))$ .

13. Find the domain of the function  $f(x) = \frac{1}{x-2}$ .

14. Determine whether the function  $f(x) = \frac{1}{x}$  is one-to-one. If it is, find its inverse. If not, explain why there is no inverse.

15. Given  $f(x) = \frac{2x+1}{3}$ , find  $f^{-1}(x)$

16. Is the function  $f(x) = -x^4 + 2x^2 - 1$  odd, even or neither?

17. Find the oblique(slant) asymptote for the graph

Of  $y = \frac{x^2 - 4x - 5}{x - 2}$ . Sketch the graph of this function.

18. Find all vertical and horizontal asymptotes for the graph

of  $y = \frac{2x - 7}{x^2 - 6x}$ . Graph the function.

19. If you deposit \$5,000 in a trust fund that pays 9.5% interest, compounded continuously, which of the following values is closest to the amount that will be in the trust after 50 years. Rounded to the nearest \$1.00.

- a) \$116.
- b) \$577,921.
- c) \$744,130.
- d) \$14,946.
- e) None of the above.

$$f(x) = \left(\frac{3}{2}\right)^{-x} + 2$$

20. Determine on what interval(s) the function is decreasing.

a)  $[3, \infty)$

d)  $(-\infty, \infty)$

b)  $(-\infty, 0]$

e) None of the above

c) Increasing Everywhere.

$$f(x) = \log_{10}(x + 2)$$

21. Find the inverse function of the function

A)  $f^{-1}(x) = e^x + 2$

B)  $f^{-1}(x) = 10^x - 2$

C)  $f^{-1}(x) = 10^x + 2$

D)  $f^{-1}(x) = e^x - 2$

E) None of the above

$$\log \frac{x^2}{y^3 z^4}$$

22. Use the properties of logarithms to simplify the expression and write as a sum difference, and/or constant multiple of logarithms.

A)  $2\log x - 3\log y + 4\log z$

B)  $\log x^2 - \log y^3 z^4$

C)  $\log(x^2 - y^3 - z^4)$

D)  $2\log x - 3\log y - 4\log z$

E) None of the above

23. Evaluate  $\log_7 125$ .

- a) 2.481262.                      b) 4.754921.                      c) 1.772095.  
d) 2.09691.                      e) None of the above.

24. Solve  $e^{2x} + 6 = 10$ .

- a)  $\ln 4$                       b)  $\ln 6$                       c)  $\ln 3$                       d)  $\ln 2$   
e) None of the above.

25. How many years will it take your money to double if you deposit it into a fund paying 10% compounded monthly?

- a) 7.27                      b) 10                      c) 241                      d) 6.96  
e) None of the above.

26. Solve  $10 + 2\ln(x - 3) = 20$ .

- a)  $3 \pm \sqrt{10}$                       d)  $e^3 + 5$   
b) 4.  
c)  $e^5 + 3$                       e) None of the above

27. The demand equation for a certain product is given by

$$p = 500 - \frac{1}{2} (e^{0.004x}).$$

Find the demands  $x$  for price  $p = \$350$ .

- a) 1426.                      b) 1079.                      c) 1860.  
d) 1513.                      e) None of the above.

28. Find the range of the function  $f(x) = 2\ln(x - 6) + 10$ .

- a)  $(6, \infty)$   
b)  $(-\infty, \infty)$   
c)  $(10, \infty)$   
d)  $(12, \infty)$   
e) None of the above.

29. Find the reference angle to the angle equal to  $290^\circ$

- a)  $70^\circ$ .                      b)  $200^\circ$                       c)  $650^\circ$                       d)  $110^\circ$ .  
e) None of the above.

$$\sin(\sin^{-1} 5)$$

30. Find the exact value of

a) 5.

b) Undefined.

c)  $\frac{1}{5}$

d) 1.

e) None of the above.

$$f(x) = \sqrt{25 - x^2}$$

31. Find the domain of the function

a)

All real numbers  $x$  such that

$$x \leq 25$$

b)

All real numbers  $x$  such that

$$x \leq 5$$

c)

All real numbers  $x$  such that

$$-5 \leq x \leq 5$$

d)

All real numbers  $x$  such that

$$x \leq -5, \text{ or } x \geq 5$$

e) None of the above.

$$\log_2 81 - \log_2 \frac{1}{27}$$

32. Find the exact value of

a) 0.477121

b) 7

c) 1.098612

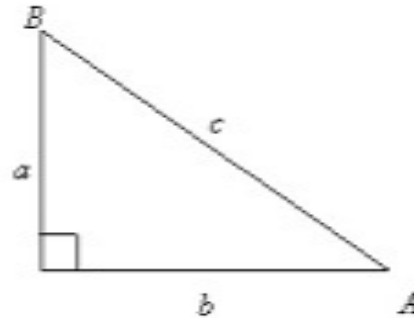
d) 1

e) None of the above.



33. If  $a = 6$  and  $c = 19$ , determine the value of  $A$ . Round to two decimal places.

- a  $17.53^\circ$
- b.  $18.41^\circ$
- .
- c  $71.59^\circ$
- d.  $76.59^\circ$
- .
- e  $72.47^\circ$
- .



34. Convert the angle of magnitude  $\frac{5\pi}{4}$  to degrees. Then, convert  $135^\circ$  to radians.

35. Assume that the world population at time  $t$  is given by  $P = P_0 e^{0.045t}$

- a. How long will it take the world population to double?
- b. To triple?
- c. How long will it take for the population to decrease to one-half?

$$y = a \cdot 10^{bx}$$

36. Find the value of  $b$  in the exponential function that passes through the points  $(5, 40)$  and  $(10, 400)$ .

- a) .2
- b) 4
- c) 0.460517
- d) 0.3979
- e) None of the above.

37. Determine two coterminal angles (one positive and one

negative) for  $\theta = \frac{3\pi}{4}$ .

a.  $\frac{13\pi}{4}, -\frac{11\pi}{4}$

b.  $\frac{9\pi}{4}, -\frac{5\pi}{8}$

c.  $\frac{7\pi}{4}, -\frac{9\pi}{4}$

d.  $\frac{3\pi}{2}, -\frac{5\pi}{12}$

e.  $\frac{11\pi}{4}, -\frac{5\pi}{4}$

38. Find the point  $(x, y)$  on the unit circle that corresponds to

the real number  $t = \frac{\pi}{4}$ . Use your results to evaluate  $\tan(t)$ .

a.  $\tan t = 1$

b.  $\tan t = 0$

$\tan t = \frac{\sqrt{3}}{2}$

c.

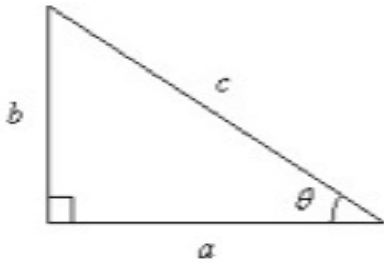
d.  $\tan t = \text{undefined}$

$\tan t = -\frac{\sqrt{3}}{2}$

e.

39.

Find the exact value of  $\csc \theta$ , using the triangle shown in the figure below, if  $a = 7$  and  $b = 24$ .



- a.  $\frac{24}{25}$
- b.  $\frac{7}{24}$
- c.  $\frac{25}{24}$
- d.  $\frac{7}{24}$
- e.  $\frac{25}{7}$

40. Determine the exact value of  $\sin(-315^\circ)$ .

- a.  $\frac{\sqrt{2}}{2}$
- b.  $-1$
- c.  $\frac{\sqrt{5}}{2}$
- d.  $1$
- e.  $-\frac{\sqrt{2}}{2}$

Bonus:

The angle of elevation of the sun is  $34^\circ$ . Find the length,  $l$ , of a shadow cast by a tree that is 53 feet tall. Round answer to two decimal places.

- a.  $l = 94.78$  feet
- b.  $l = 59.45$  feet
- c.  $l = 79.09$  feet
- d.  $l = 63.93$  feet
- e.  $l = 78.58$  feet

Good Luck