Part I – NO CALCULATORS PERMITTED. Complete Part I and submit to your instructor, you will then receive Part II. You will not be able to return to Part I to do additional work once submitted. Work quickly and accurately. Place your answers on this exam. Value is 100 points; 4 points per question. Maximum time limit: 1.5 hour.

1. Add and simplify: $\frac{x}{5} + \frac{2x}{7}$

2. Write the equation of the line through the points (3, 4) and (5, 10) in slope intercept form.

3. Convert from radians to degrees: $\frac{-1}{2}\pi$

4. Divide and simplify the compound fraction: $\frac{4x/5}{8x^2/15}$

5. Factor completely: $x^2 + 9x + 20$

6. Rewrite the expression as a single logarithm: $\log_3 (2) + 2 \log_3 (2)$

a. $\log_3 (4)$
b. 1
c. $\log_8 (3)$
d. $\ln (8)$
e. $\log_3 (8)$

7. State the exact value of the expression: $\cos^{-1} (0)$

a. $\frac{1}{4}\pi$
b. 1
c. π
d. 0
e. $\frac{1}{2}\pi$

8. Suppose the graph of f(x) is given. Describe how the graph of the function y can be obtained from the graph of f(x). $y = 7f(x) - 3$

a. Stretch the graph of y = f(x) vertically by a factor of 3, and then shift downward 7 units.
b. Compress the graph of y = f(x) vertically by a factor of 3, and then shift upward 7 units.
c. Stretch the graph of y = f(x) vertically by a factor of 7, and then shift downward 3 units.
d. Stretch the graph of y = f(x) vertically by a factor of 7, and then shift upward 3 units.
e. Reflect the graph of y = f(x) about the y-axis and then shift downward 3 units.

9. The measure of the angle $13\pi / 4$ in standard position is given. Find minimal positive and maximal negative angels that are coterminal with the given angle.

a. $\frac{5}{4}\pi$ and $\frac{21}{4}\pi$
b. $\frac{1}{4}\pi$ and $\frac{-1}{4}\pi$
c. $\frac{5}{4}\pi$ and $\frac{-3}{4}\pi$
d. $\frac{9}{4}\pi$ and $\frac{1}{4}\pi$
e. $\frac{13}{4}\pi$ and $\frac{-13}{4}\pi$

10. Determine the domain (D) and the range (R) of the function $h(x) = 5 - e^x$

a. D: $(-\infty, \infty)$, R: $(-\infty, 0)$
b. D: $(-\infty, 5)$, R: $(-\infty, \infty)$
c. D: (-2, 2), R: (-5, 5)
d. D: $(-\infty, \infty)$, R: $(5,\infty)$
e. D: $(-\infty, \infty)$, R: $(-\infty, 5)$

11. State the domain of the function: $f(x) = \frac{\sqrt{x}}{x^2 - 16x + 48}$

a. (4, 12)
b. [4, 12]
c. $(-\infty, \infty)$
d. $(-\infty, 4) \cup (4, 12) \cup (12, \infty)$
e. $[0,4) \cup (4, 12) \cup (12, \infty)$

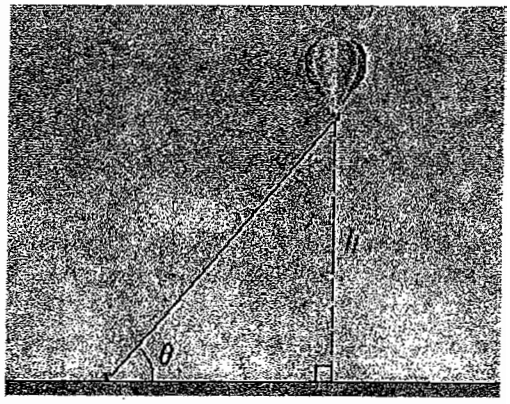
12. Find one angle on the interval [0, 360°] that is coterminal with the angle -285°

a. 95°
b. 49°
c. 43
d. 75°
e. no solution

13. Express the equation $3^4 = 81$ in logarithmic form.

a. $\log_3 81 = 4$
b. $\log_4 3 = 81$
c. $\log_4 81 = 3$
d. $\log_{81} 3 = 4$
e. none of these

14. A 770-feet rope anchors a hot air balloon. Express the angle θ in the figure as a function of the height h.



a. $\arcsin\left(\frac{h}{770}\right)$
b. $\tan\left(\frac{h}{770}\right)$
c. $\tan^{-1}\left(\frac{h}{770}\right)$
d. $\cos^{-1}\left(\frac{h}{770}\right)$
e. $\cos\left(\frac{770}{h}\right)$

15. Use $f(x) = 2x - 8$ and $g(x) = 4 - x^2$ to evaluate the $f(g(-1))$.

a. -96
b. -2
c. -7
d. 6
e. -28

16. Use the Laws of Logarithms to rewrite the expression in a form with no logarithm of a product, quotient or power. $\text{Log}_7 \sqrt{x+5}$

a. ½ ($\log_7 x + \log_7 5$)
b. $\sqrt{\log(x+5)}$
c. $2 \log_7 (x + 5)$
d. $\log_7\left(\frac{x+5}{2}\right)$
e. ½ $\log_7 (x + 5)$

17. Suppose that the terminal point determined by t is $(\frac{4}{7}, \frac{\sqrt{33}}{7})$. Find the point determined by $t + \pi$.

a. $(\frac{4}{7}, \frac{\sqrt{33}}{7})$
b. $(-\frac{4}{7}, -\frac{\sqrt{33}}{7})$
c. $(-\frac{\sqrt{33}}{7}, -\frac{4}{7})$
d. $(\frac{4}{7}, -\frac{\sqrt{33}}{7})$
e. $(-\frac{4}{7}, \frac{\sqrt{33}}{7})$

18. Find the reference angle for the angle measuring $\frac{15}{11}\pi$.

a. $\frac{-4}{11}\pi$
b. $\frac{4}{11}\pi$
c. $\frac{4}{15}\pi$
d. $\frac{11}{4}\pi$
e. $\frac{7}{11}\pi$

19. State the asymptote of the function $g(x) = 6^x - 9$

a. $y = -9$
b. $y = 0$
c. $y = 6$
d. $y = -6$
e. $y = 9$

20. Express the equation $\ln(x + 1) = 4$ in exponential form.

a. $x = e - 4$
b. $x = e + 4$
c. $x = e^4 + 1$
d. $x = e^4 - 1$
e. none of these

21. Simplify the expression: $\sqrt{75} - \sqrt{12}$

a. $7\sqrt{3}$
b. $3\sqrt{3}$
c. $\sqrt{87}$
d. $\sqrt{63}$
e. $3\sqrt{7}$

22. Find the equation of the line perpendicular to $3y - 2x - 21 = 0$

a. $y = \frac{3x}{2}$

b. $y = \frac{2x}{3} + 7$

c. $y = \frac{-2x}{3}$

d. $y = \frac{-3x}{2}$

e. none of these

23. Simplify the expression $(\frac{3x^4y}{xy^{-3}})^2$ and eliminate any negative exponents

a. $9x^6y^8$

b. $6x^5y^6$

c. $9x^{10}y^4$

d. $6x^6y^8$

c. $9x^5y^6$

24. The function, $h(x) = 4x^3 + 8x - 5$ is

a. even function

b. piecewise function

c. odd function

d. neither even nor odd

e. cannot be determined by the information given

25. Based on the graph of the function, g(x), identify which of the following is true.

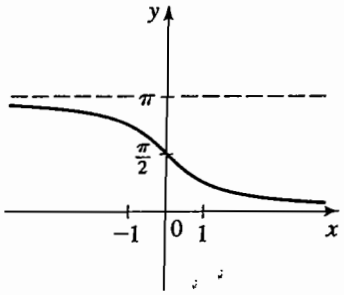
a. even function

b. cubic function

c. odd function

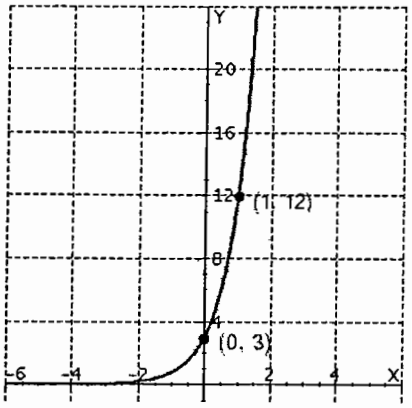
d. step function

e. one-to-one function



Part II – CALCULATORS ARE PERMITTED. You have completed Part I and will not be able to return to it. You are permitted to work on this section for the remainder of the exam period. Place all work in your Blue Book. Value is 100 points; 10 points per question. Partial credit is awarded.

26. Find the function of the form $f(x) = Ca^x$ whose graph passes through (1, 12) and (0, 3) as shown.

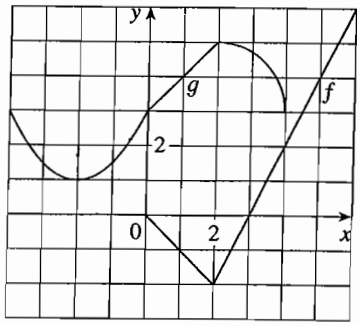


27. A. Solve the logarithmic equation for x: $\ln(9x + 6) = 2$

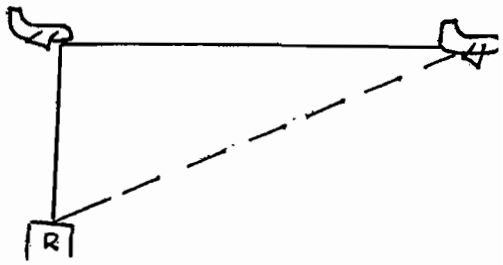
B. Find all solutions to the equation: $\sec^2\theta - 2 = 0$

28. The graphs of f and g are given. If defined, determine the value of:

$f(g(5))$ and $g(f(2))$



29. An airplane is flying parallel to the ground at an altitude of 4 miles. The plane is flying at a speed of 250 mph and passes directly over a radar station at time t=0. Find the distance between the plane and the radar station 30 minutes later.



30. Perform the operation and simplify the expression: $\dfrac{(x^2-3x-40)(5+x)}{(x^2-25)(8-x)}$

31. A. Given triangle XYZ where angle Z = 68°, side y = 56 and side z = 80. Determine the measure of angle Y.

    B. Find the area of a triangle with sides of length 9 and 13 and included angle of 50°.

32. A. One large pond is stocked with fish. The fish population is modeled by the formula $\mathbf{P = 2t + 7\sqrt{t} + 269}$, where t is the number of days since the fish were first introduced into the pond. How many days will it take the fish population to reach 416?

    B. Solve the equation for x: $\dfrac{1}{x} = 1 + \dfrac{5}{2x}$

33. Consider the piecewise function:

$$G(x) = \begin{cases} -x + 2 & \text{if } x < 1 \\ x^2 & \text{if } x > 1 \end{cases}$$

    A. Sketch the graph of G(x)

    B. Using interval notation, state the Domain and Range of G(x)

    C. Using interval notation, state where G(x) is increasing and decreasing

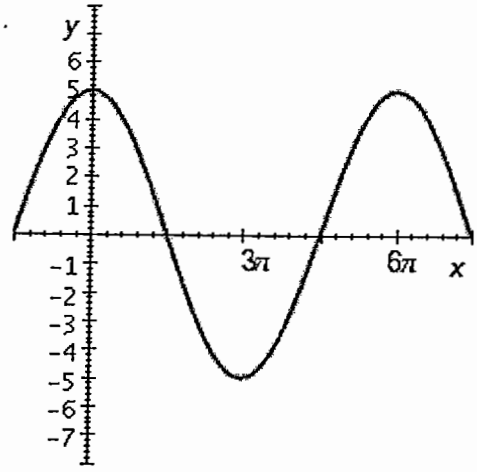
34. For the graph below, determine the appropriate vertical / horizontal shifts and changes to the amplitude and period that are applicable for the function: a Cos (kx + b) + c

a = _____

k = _____

b = _____

c = _____



35. The height h, in feet, of a punted football can be modeled by the quadratic function $h(x) = -0.01x^2 + 1.18x + 2$ where x is the horizontal distance in feet from the point of impact with the punters foot.

A. Sketch the path of the football.

B. What is the maximum height of the punted ball?

C. How far down the field has the ball traveled when it reaches a height of 7 feet?