- 1. Given $f(x) = 18x^3 3x^2 + 2$, evaluate f(-3).
- 2. Given $f(x) = \sin x$ and $g(x) = \ln x$, find $f(\pi/4) + g(e^{\sqrt{2}})$.
- 3. Find the domain of the function $h(x) = \sqrt{f(x)}$, where $f(x) = x^3 4x^2 + x + 6$. (Hint: f(-1) = 0.)
- 4. Given $f(x) = \frac{x^2-1}{x+3}$ and $g(x) = \frac{1}{3x}$, find the domain of $f \circ g$.
- 5. Find and simplify the difference quotient for the function $f(x) = \sqrt{x}$. Recall that the difference quotient for a function f is $\frac{f(x+h)-f(x)}{h}$.
- 6. A fire spreads in a circular pattern at a rate of 12 ft^2 per hour. Assuming that the initial radius of the fire is zero, find an equation for the radius r in feet of the fire at any time t in hours.
- 7. Find the average rate of change of $f(x) = 3x^2 + 2x 7$ on the interval [12, 15].
- 8. A conical tank with a height of 13 feet and radius 7 feet is being filled with water at a rate of 8 ft³/min. Find an expression for the height of the water h in feet at time t in minutes.
- 9. A property tax is assessed on a home's value. A tax of 4.25% is assessed on the first \$150,000 value of the home and at a tax rate of 9.25% is assessed on any value over \$150,000. Find a piecewise function T to determine the tax assessed on a home worth x dollars.
- 10. Given $h(x) = \sqrt{144x^2 + 9}$, evaluate h(a) + h(3).
- 11. Find the range of the function g(x), where

$$g(x) = \begin{cases} x^2 + 1 & \text{if } x \le 0\\ x - 1 & \text{if } x > 0 \end{cases}$$

- 12. Given $f(x) = \frac{3x-1}{12x+8}$ and g(x) = 8x 7, evaluate $(f \circ g)(2)$.
- 13. Factor and simplify the following expression.

$$(3x^2+1)^{-2}(x-1)^3 - (3x^2+1)^{-3}(x-1)^6$$

14. A farmer wishes to fence in a field with an area of 12250 ft², with a fence in the middle dividing the two areas. He then wants to put a gate on one side of the field and another gate in the middle fence with each gate having a width of g = 12 feet. If the fencing costs \$13.31 per foot, express the cost of the fencing C as a function of the width w. Do not include the lengths of the gates. The picture is given below.





- 15. If \$323,323,323 is invested in an offshore account with an interest rate of 12.3% that is compounded continuously, determine the balance in the account after 7 years.
- 16. Find the maximum value of the function $f(x) = -8x^2 + 12x 10$.
- 17. Find all intervals on which f(x) < 0, where

$$f(x) = (x-3)(x-2)(x-1)(x+1)(x+2)(x+3).$$

18. Find any and all holes and asymptotes of

$$f(x) = \frac{-21x + 4x^2 + x^3}{x^2 + 6x + 9}$$

- 19. At a price of \$430, an airline can sell 300 tickets per day. It is determined that for every \$15 increase in ticket price, 10 fewer tickets will be sold. At what price should the airline sell the tickets to maximize revenue?
- 20. Find the x-value at which the graph of g crosses its horizontal asymptote.

$$g(x) = \frac{8x^2 + x + 2}{4x^2 - 2x + 1}$$

- 21. You want to buy a house after graduation and want to have enough cash for the down payment of 20%. Assume you graduate four years from now and that you want to buy a house worth \$150,000. If you have \$10,000 now, what kind of interest rate with continuous compounding would you need to be able to afford the down payment?
- 22. You have discovered a wild flock of dodo birds and wish to domesticate them on your plot of land. You wish to use 3000 feet of fencing to enclose a rectangular plot along the river. You don't need any fencing along the river because these birds are dumb and they have no natural predators in the area. Find the length of the longest side of the fencing that will maximize the area of the enclosed field.
- 23. A Samsung Galaxy Note 7 is fired upward with an initial velocity of 200 feet per second. The height in feet above sea level of the projectile is given by the equation $h(t) = -16t^2 + 300t + 65$. Find the maximum height of the device.

24. Find all intervals on which f(x) > 0

$$f(x) = \frac{x+7}{2x-8}.$$

25. Find all of the horizontal asymptotes of the function

$$g(x) = \frac{x+1}{(x+2)(x-3)}.$$

- 26. Find the inverse function f^{-1} of the function $f(x) = \frac{x+3}{x+6}$.
- 27. Simplify the expression.

$$(e^{12x} + e^{-12x})(e^{12x} - e^{-12x})$$

- 28. For the function $f(x) = \sqrt{x^4 16}$, find the range of the inverse function f^{-1} .
- 29. Evaluate $\sin(45) \cos(45)$ to four decimal places.
- 30. Convert $\theta = \frac{4\pi}{7}$ to DMS, rounding to the nearest second.
- 31. Given $\sec \theta = \frac{13}{5}$ and $\sin \theta < 0$, find the value of the other 5 trig functions.
- 32. Hydrogen has a half-life of 12.32 years. How long will it take for some sample of hydrogen to decay by 84%?
- 33. Find the acute angle θ to the nearest 0.1° that solves the equation

$$\cos\theta = -0.354.$$

34. Solve the following equation for x.

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

35. Solve for x.

$$2^{3x-1} = 3^{4x+2}$$

- 36. Find the general solution to the equation $\sqrt{3} \tan(\frac{1}{3}\theta) = 1$.
- 37. A ladder 42 feet long leans against the side of a building. The angle between the ladder and the building is 57°. Estimate the distance from the base of the building to the ladder along the ground to two decimal places.
- 38. Find all solutions to the following system of equations.

$$\begin{cases} 5x + 2y = 29\\ 4x + y = 19 \end{cases}$$

- 39. A surveyor standing on a hill 28 feet high looks at a building across a river. The surveyor determines that the angle of depression to the base of the building is 23°52' and the angle of elevation to the top of the building to be 36°49'. Calculate the height of the building in feet to two decimal places.
- 40. Graph $y = -3\cos(\pi x.)$
- 41. In what quadrant will the terminal side of θ lie if $\tan \theta < 0$ and $\cos \theta > 0$?
- 42. Evaluate $\cos(\frac{2\pi}{3})$.
- 43. For the function $h(x) = \cos(\frac{x}{2})$, find all intervals where h(x) < 0 on the interval $[0, 2\pi]$. Where is h increasing on the same interval?
- 44. Solve the following system of equations.

$$\begin{cases} 3x - 2y - 4z = 52\\ 4x - 4y + z = 61\\ 4x - 2y - 4z = 60 \end{cases}$$

45. Write the following augmented matrix in reduced row-echelon form.

$$\begin{bmatrix} 4 & -3 & 5 \\ 1 & 3 & -10 \end{bmatrix}$$

46. Write the following augmented matrix in reduced row-echelon form.

$$\begin{bmatrix} 1 & 3 & 3 & | & -6 \\ 1 & -3 & 0 & | & 6 \\ 1 & 4 & -4 & | & -8 \end{bmatrix}$$

47. Find $\lim_{x \to -1^-} f(x)$ and $\lim_{x \to -1^+} f(x)$, where

$$f(x) = \frac{x^2 - 4x - 5}{x^2 - 1}.$$

Determine $\lim_{x \to -1} f(x)$ if it exists.

48. Compute the following limit.

$$\lim_{x \to 0} \frac{5x}{x^2 + 4x}$$

- 49. Using the graph of f that follows, find the following limits if they exist
 - (a) $\lim_{x \to -2^+} f(x)$ (b) $\lim_{x \to -2} f(x)$

(c) $\lim_{x \to 2} f(x)$ (d) $\lim_{x \to 4} f(x)$



50. Find $\lim_{x \to 0} f(x)$ where

$$f(x) = \frac{\sqrt{13x + 17} + \sqrt{17}}{x}.$$

51. Find $\lim_{x \to 0} f(x)$, where

$$f(x) = \frac{\frac{11}{x+3} - \frac{11}{3}}{x}.$$