Exam Review Mth 1314

List the intercepts and type(s) of symmetry, if any.

1) $y = \dfrac{-x^5}{x^2 - 5}$

Answer: intercept: (0, 0)
symmetric with respect to origin

Determine whether the equation defines y as a function of x.

2) a) $y^2 = 6 - x^2$ b) $y = \dfrac{1}{x}$

Answer: not a function Answer : functior

Find the value for the function.

3) Find f(x + 1) when $f(x) = \dfrac{x^2 - 3}{x + 5}$.

Answer: $\dfrac{x^2 + 2x - 2}{x + 6}$

Find the domain of the function. Find any vertical and horizontal asymptotes.

4) $h(x) = \dfrac{x - 4}{x^3 - 16x}$

Answer: $\{x \mid x \neq -4, 0, 4\}$

For the given functions f and g, find the requested function.

5) $f(x) = x - 2$; $g(x) = 6x^2$

a) Find $(f + g)(x)$ b) find $(f - g)(x)$ c) find $(f \circ g)(x)$ d) find $(g \circ f)(x)$
e) Find $(f \circ f)(x)$ f) find $(g \circ g)(x)$

Answer: $(f + g)(x) = 6x^2 + x - 2$ $(f - g)(x) = x - 2 - 6x^2$
$(f \circ g)(x) = 6x^2 - 2$ $(g \circ f)(x) = 6x^2 - 24x + 24$
$(f \circ f)(x) = x - 4$ $(g \circ g)(x) = 216x^4$

Write an equation that results in the indicated translation.

6) The squaring function, shifted 7 units downward, right 3 units and reflected over the x–axis.

Answer: $y = -(x - 3)^2 - 7$

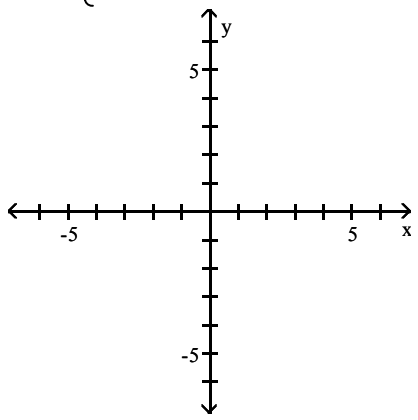
Find the average rate of change for the function between the given values.

7) $f(x) = x^2 + 9x$; from 5 to 7

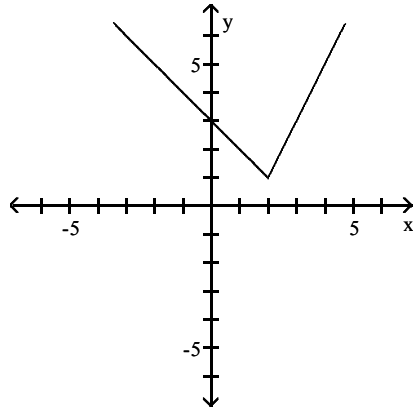
Answer: 21

Graph the function.

8) $f(x) = \begin{cases} -x + 3 & \text{if } x < 2 \\ 2x - 3 & \text{if } x \geq 2 \end{cases}$

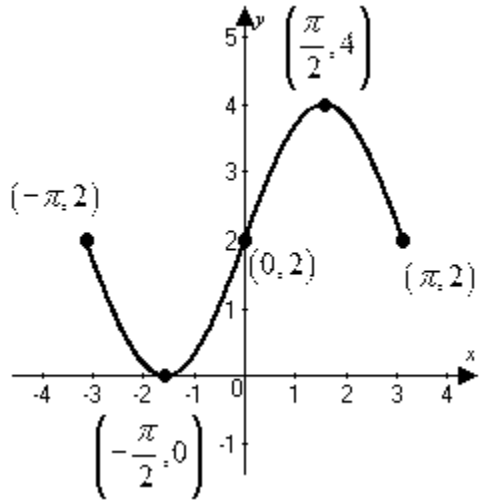


Answer:



Use the graph to find the intervals on which it is increasing, decreasing, or constant. What are the intercepts? Find f(π).

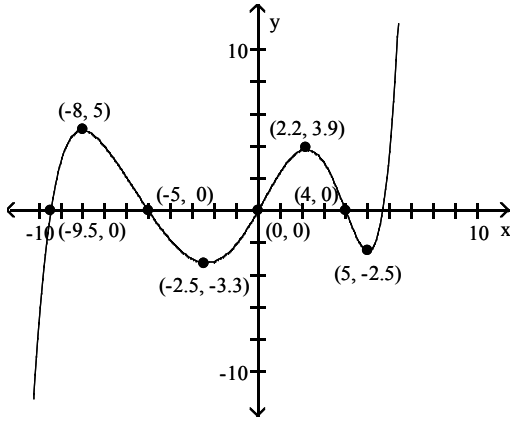
9)



Answer: Decreasing on $\left(-\pi, -\frac{\pi}{2}\right)$ and $\left(\frac{\pi}{2}, \pi\right)$; increasing on $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$. y–int = 2, x–int = $-\frac{\pi}{2}$, $f(\pi) = 2$

Find the numbers, if any, at which f has a local minimum. What are the local maxima?

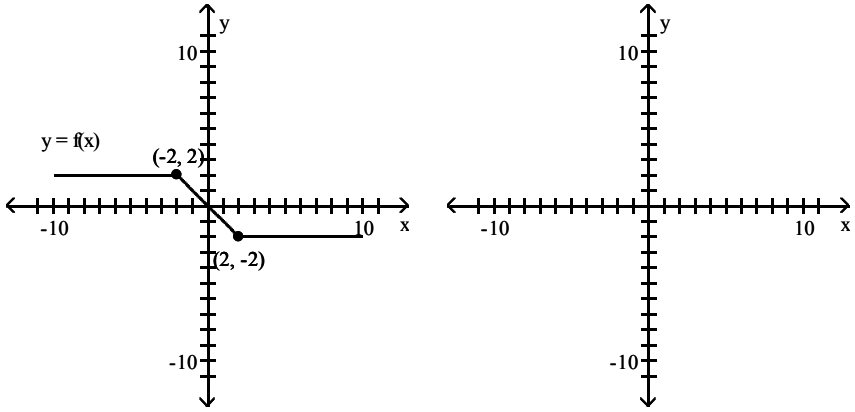
10)



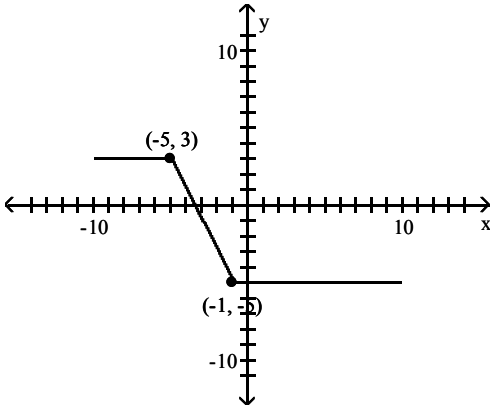
Answer: f has a local minimum at x = –2.5 and 5; the local maxima at x = –8 and 2.2.

Use the accompanying graph of y = f(x) to sketch the graph of the indicated equation.

11) y = 2f(x + 3) – 1



Answer:



Find the vertex and axis of symmetry of the graph of the function.

12) $f(x) = x^2 - 11x - 1$

Answer: $\left(\frac{11}{2}, -\frac{125}{4}\right)$; $x = \frac{11}{2}$

Determine the domain and the range of the function. Determine where the function is increasing and decreasing.

13) $f(x) = x^2 - 4x + 4$

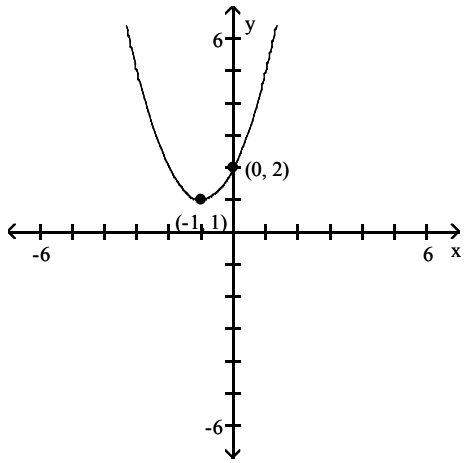
Answer: domain: all real numbers
range: $\{y \mid y \geq 0\}$
inc : $(2, \infty)$ dec : $(-\infty, 2)$

b) Solve $x^2 - 4x + 4 \leq 0$

Answer: $x = 2$

Determine the quadratic function whose graph is given.

14)



Answer: $f(x) = x^2 + 2x + 2$

Determine, without graphing, whether the given quadratic function has a maximum value or a minimum value and then find that value.

15) $f(x) = x^2 - 3x - 8$

Answer: minimum; $-\frac{41}{4}$

Solve the problem.

16) The manufacturer of a CD player has found that the revenue R (in dollars) is $R(p) = -5p^2 + 1280p$, when the unit price is p dollars. If the manufacturer sets the price p to maximize revenue, what is the maximum revenue to the nearest whole dollar?

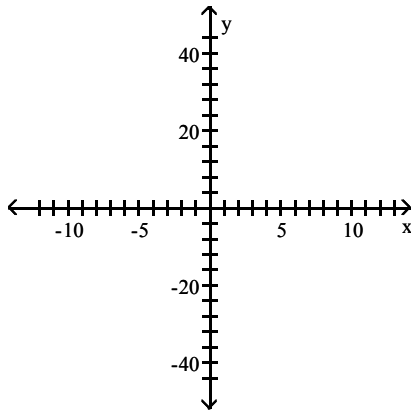
Answer: $81,920

17) The number of mosquitoes M(x), in millions, in a certain area depends on the June rainfall x, in inches: $M(x) = 13x - x^2$. What rainfall produces the maximum number of mosquitoes?

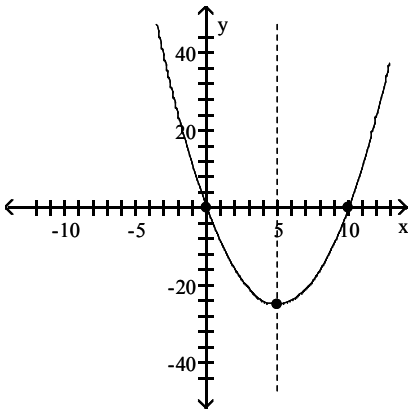
Answer: 6.5 in.

Graph the function using its vertex, axis of symmetry, and intercepts.

18) $f(x) = x^2 - 10x$



Answer: vertex (5, –25)
intercepts (0, 0), (10, 0)



Form a polynomial whose zeros and degree are given.

19) Zeros: 3, multiplicity 2; –3, multiplicity 2; degree 4

Answer: $f(x) = x^4 - 18x^2 + 81$

For the polynomial, determine the following :

a) list each zero and its multiplicity
b) determine whether the graph crosses or touches the x–axis at each x –intercept
c) determine the degree of the polynomial
d) determine the end behavior of the function
e) determine the maximum number of turning points
f) find the y–intercept

20) $f(x) = 3(x + 2)(x - 4)^3$

Answer: –2, multiplicity 1, crosses x–axis; 4, multiplicity 3, crosses x–axis
degree = 4, starts : positive ends : positive
maximum number turning pts : 3
y–int = –384

Form a polynomial f(x) with real coefficients having the given degree and zeros.

21) Degree: 4; zeros: –1, 2, and 1 – 2i.

Answer: $f(x) = x^4 - 3x^3 + 5x^2 - x - 10$

Find the real solutions of the equation.

22) $2x^3 - 13x^2 + 22x - 8 = 0$

Answer: $\left\{\frac{1}{2}, 2, 4\right\}$

Use the given zero to find the remaining zeros of the function.

23) $f(x) = x^3 + 2x^2 - 6x + 8$; zero: $1 + i$

Answer: $1 - i, -4$

Find all zeros of the function and write the polynomial as a product of real factors.

24) $f(x) = x^3 - x^2 + 16x - 16$

Answer: $x = 1, 4i, -4i$

$f(x) = (x - 1)(x^2 + 16)$

b) $f(x) = x^4 + 7x^3 + 16x^2 + 28x + 48$

Answer: $x = -3, -4, 2i, -2i$

$f(x) = (x + 3)(x + 4)(x^2 + 4)$

For the given functions f and g, find the requested composite function value.

25) $f(x) = \sqrt{x + 3}$, $g(x) = 5x$

a) Find $(f \circ g)(3)$

Answer: $3\sqrt{2}$

b) $(g \circ f)(x)$

$5\sqrt{(x + 3)}$

c) $(g \circ g)(-2)$

-50

The function f is one–to–one. Find its inverse. How do you know if it is one–to–one?

26) $f(x) = \frac{4x - 1}{7}$

Answer: $f^{-1}(x) = \frac{7x + 1}{4}$

b) $f(x) = 6x^2 - 3, x \geq 0$

$f^{-1}(x) = \sqrt{\frac{x+3}{6}}$

functions are one–to–one because there are no even exponents on x or y.

Solve the equation.

27) $2^{7 - 3x} = \frac{1}{4}$

Answer: $\{3\}$

b) $\left(\frac{25}{9}\right)^{x + 1} = \left(\frac{3}{5}\right)^{x - 1}$

$x = -1/3$

c) $e^{x - 3} = \left(\frac{1}{e^2}\right)^{x + 6}$

$x = -3$

Find the exact value of the logarithmic expression.

28) $\log_5 \sqrt{5}$

Answer: $\frac{1}{2}$

b) $\log_4 \frac{1}{64}$

-3

c) $10^{\log 24 - \log 3}$

8

Solve the equation.

29) $6 \ln 5x = 24$

Answer: $\left\{\frac{e^4}{5}\right\}$

b) $\log_3 (x + 2) = -2$

$-\frac{17}{9}$

Write as the sum and/or difference of logarithms. Express powers as factors.

30) $\log_4 \left(\frac{x^2}{y^6}\right)$

Answer: $2\log_4 x - 6\log_4 y$

Express as a single logarithm.

31) $\frac{1}{2}(\log_7 (x - 3) - \log_7 x)$

Answer: $\log_7 \sqrt{\frac{x - 3}{x}}$

Use the Change–of–Base Formula to evaluate the logarithm. Round your answer to three decimal places.

32) $\log_3 0.412$

Answer: -0.807

Solve the equation.

33) $\log (2 + x) - \log (x - 3) = \log 2$

Answer: $\{8\}$

b) $\log_3 x + \log_3(x - 24) = 4$

$x = 27$

34) $3^{2x} + 3^x - 6 = 0$

Answer: $\left\{\frac{\ln 2}{\ln 3}\right\}$

b) $\left(\frac{5}{7}\right)^x = 2^{1 - x}$

$x = 1.941$

c) $e^{x + 2} = 5$

$x = -0.391$