

5-6 The Remainder and Factor Theorems

Use synthetic substitution to find $f(4)$ and $f(-2)$ for each function.

1. $f(x) = 2x^3 - 5x^2 - x + 14$

ANSWER:

58; -20

2. $f(x) = x^4 + 8x^3 + x^2 - 4x - 10$

ANSWER:

758; -46

3. **NATURE** The approximate number of bald eagle nesting pairs in the United States can be modeled by the function $P(x) = -0.16x^3 + 15.83x^2 - 154.15x + 1147.97$, where x is the number of years since 1970. About how many nesting pairs of bald eagles can be expected in 2018?

ANSWER:

12,526

Given a polynomial and one of its factors, find the remaining factors of the polynomial.

4. $x^3 - 6x^2 + 11x - 6; x - 1$

ANSWER:

$x - 2, x - 3$

5. $x^3 + x^2 - 16x - 16; x + 1$

ANSWER:

$x + 4, x - 4$

6. $3x^3 + 10x^2 - x - 12; x - 1$

ANSWER:

$x + 3, 3x + 4$

7. $2x^3 - 5x^2 - 28x + 15; x + 3$

ANSWER:

$x - 5, 2x - 1$

27. **BOATING** A motor boat travelling against waves accelerates from a resting position. Suppose the speed of the boat in feet per second is given by the function $f(t) = -0.04t^4 + 0.8t^3 + 0.5t^2 - t$, where t is the time in seconds.

- a. Find the speed of the boat at 1, 2, and 3 seconds.
b. It takes 6 seconds for the boat to travel between two buoys while it is accelerating. Use synthetic substitution to find $f(6)$ and explain what this means.

ANSWER:

a. 0.26 ft/s, 5.76 ft/s, 19.86 ft/s

b. 132.96 ft/s; This means the boat is travelling at 132.96 ft/s when it passes the second buoy.

44. $27x^3 + y^3 =$

A $(3x + y)(3x + y)(3x + y)$

B $(3x + y)(9x^2 - 3xy + y^2)$

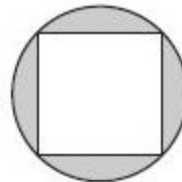
C $(3x - y)(9x^2 + 3xy + y^2)$

D $(3x - y)(9x^2 + 9xy + y^2)$

ANSWER:

B

45. **GRIDDED RESPONSE** In the figure, a square with side length $2\sqrt{2}$ is inscribed in a circle. The area of the circle is $k\pi$. What is the exact value of k ?



ANSWER:

4

46. What is the product of the complex numbers $(4 + i)(4 - i)$?

F 15

G $16 - i$

H 17

J $17 - 8i$

ANSWER:

H

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47. **SAT/ACT** The measure of the largest angle of a triangle is 14 less than twice the measure of the smallest angle. The third angle measure is 2 more than the measure of the smallest angle. What is the measure of the smallest angle?

A 46
 B 48
 C 50
 D 52
 E 82

ANSWER:

B

Solve each equation.

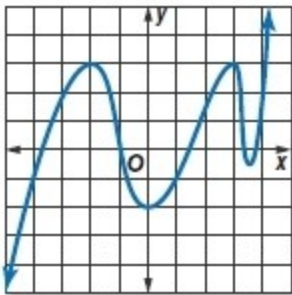
49. $x^4 - 6x^2 = 27$

ANSWER:

$\pm 3, \pm i\sqrt{3}$

Complete each of the following.

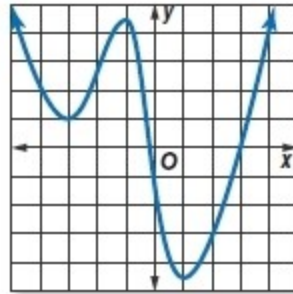
- Estimate the x coordinate of every turning point and determine if those coordinates are relative maxima or relative minima.
- Estimate the x -coordinate of every zero.
- Determine the smallest possible degree of the function.
- Determine the domain and range of the function.



52.

ANSWER:

- $-2(\text{max}), 0(\text{min}), 3(\text{max}), 3.5(\text{min})$
- $-3.75, -1, 1.5, 3.25, 3.75$
- 5
- D: {all real numbers}; R: {all real numbers}



53.

ANSWER:

- $-3(\text{min}), -1(\text{max}), 1(\text{min})$
- $-0.25, 3$
- 4
- D: {all real numbers}; R: $\{y \mid y \geq 4.5\}$

54. **HIGHWAY SAFETY** Engineers can use the

formula $d = 0.05v^2 + 1.1v$ to estimate the minimum stopping distance d in feet for a vehicle traveling v miles per hour. If a car is able to stop after 125 feet, what is the fastest it could have been traveling when the driver first applied the brakes?

ANSWER:

about 40.2 mph

Solve by graphing.

56. $3x + 2y = 8$
 $-4x + 6y = 11$

ANSWER:

