

Summer Work
PreCalculus

1. Write an equation of a line in point-slope form that is parallel to $2x - 3y = 6$ and passes through the point $(2, -1)$.

2. Determine the domain, range, y-intercept and zeros of each of the following:
(a) $f(x) = x^2 - 5$ (b) $g(x) = \sqrt{x+3} - 1$ (c) $h(x) = e^x$ (d) $k(x) = -|x| + 2$

3. If $f(x) = x - 5$ and $g(x) = x^2 - 1$, find $f(g(x))$ and $g(f(x))$.

4. Determine the inverse function of $f(x) = \sqrt{x-1} + 4$.

5. Simplify the following:
(a) $(\sqrt{-12})(\sqrt{-3})$ (b) $\sqrt{-18} - \sqrt{-3}$ (c) $\frac{4}{3+i}$ (d) $(2i\sqrt{5})^2$

6. Factor using synthetic division and solve the equation $x^3 - 2x^2 - 5x + 6 = 0$.

7. Determine the vertex coordinates, the axis of symmetry and the range of the quadratic function:
$$f(x) = (x - 2)^2 + 6$$

8. Write an equation of a polynomial function in factored form whose graph will cross the x -axis at $x = -3$ and will be tangent to the x -axis at $x = 2$.

9. Solve the following equations:

(a) $9^{x+1} = 27^{x-2}$ (b) $e^x = 3$ (c) $\log_3(x-6) + \log_3(x+3) = \log_3 10$ (d) $\log_2(x-5) = 3$

10. Simplify and/or evaluate:

(a) $(2^{-1} + 2)^2$ (b) $e^{2\ln 3}$ (c) $9^{\left(-\frac{1}{2}\right)}$ (d) $\frac{8x^{-2}y^3}{4x^2y^2}$ (e) $\log_3\left(\frac{1}{81}\right)$

11. If the terminal ray of an angle passes through the point $(-5, -12)$, determine the values of all six of the trig functions of the angle.

12. Evaluate the following:

(a) $\sin 30^\circ$ (b) $\cos \frac{\pi}{4}$ (c) $\tan \pi$ (d) $\sin \frac{3\pi}{2}$ (e) $\cos 210^\circ$

(f) $\csc 120^\circ$ (g) $\cot 225^\circ$ (h) $\sin \frac{\pi}{2}$ (i) $\sec \frac{5\pi}{3}$ (j) $\cos 180^\circ$

13. State the domain, range, amplitude and period of the graph of $y = 2 \sin\left(\frac{1}{3}x\right)$.

14. Solve the following equations over the domain $[0, 2\pi)$:

(a) $2 \sin x - 1 = 0$ (b) $\tan^2 x = 1$ (c) $2 \cos^2 x - \cos x = 1$

Answers:

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

- 2 (a) Dom: $(-\infty, \infty)$
Range: $[-5, \infty)$
zeros: $x = \pm\sqrt{5}$
 y -int: $(0, -5)$
- (b) Dom: $[-3, \infty)$
Range: $[-1, \infty)$
zero: $x = -2$
 y -int: $(0, \sqrt{3}-1)$
- (c) Dom: $(-\infty, \infty)$
Range: $(0, \infty)$
zero: *none*
 y -int: $(0, 1)$
- (d) Dom: $(-\infty, \infty)$
Range: $(-\infty, 2]$
zeros: $x = \pm 2$
 y -int: $(0, 2)$

3. $f(g(x)) = x^2 - 6$; $g(f(x)) = (x-5)^2 - 1$

4. $f^{-1}(x) = (x-4)^2 + 1$

5. (a) -6 (b) $i\sqrt{3}$ (c) $\frac{6}{5} - \frac{2}{5}i$ (d) -20

6. $x = 1, 3, -2$

7. vertex: $(2, 6)$; axis of symmetry: $x = 2$; range: $[6, \infty)$

8. $y = (x+3)(x-2)^2$

9. (a) $x = 8$ (b) $x = \ln 3$ (c) $x = 7$ (d) $x = 13$

10. (a) $\frac{25}{4}$ (b) 9 (c) $\frac{1}{3}$ (d) $\frac{2y}{x^4}$ (e) -4

11. $\sin \theta = -\frac{12}{13}$ $\cos \theta = -\frac{5}{13}$ $\tan \theta = \frac{5}{12}$ $\csc \theta = -\frac{13}{12}$ $\sec \theta = -\frac{13}{5}$ $\cot \theta = \frac{12}{5}$

12. (a) $\frac{1}{2}$ (b) $\frac{\sqrt{2}}{2}$ (c) 0 (d) -1 (e) $-\frac{\sqrt{3}}{2}$

(f) $\frac{2\sqrt{3}}{3}$ (g) 1 (h) 1 (i) 2 (j) -1

13. Domain: $(-\infty, \infty)$; range: $[-2, 2]$; amplitude: 2; period: 6π

14. (a) $x = \frac{\pi}{6}, \frac{5\pi}{6}$ (b) $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ (c) $x = 0, \frac{2\pi}{3}, \frac{4\pi}{3}$