2025 Precalculus Exam

1. Find the value of $\sin(30°)$.

   (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$
   (e) None of the above

2. A bag contains 3 red, 4 blue, and 5 green marbles. One marble is drawn at random. What is the probability that the drawn marble is either red or blue?

   (a) $\frac{7}{12}$ (b) $\frac{1}{2}$ (c) $\frac{7}{15}$ (d) $\frac{1}{3}$ (e) $\frac{3}{4}$

3. Find the sum of the infinite series:
   $$4 + 2 + 1 + \frac{1}{2} + \cdots.$$
   (a) 4 (b) 6 (c) 7 (d) 8 (e) 10

4. Find the solution set to $2\sin(2\theta) - 1 = 0$ on the interval $[0, 2\pi)$.

   (a) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$ (b) $\left\{\frac{\pi}{12}, \frac{5\pi}{12}\right\}$ (c) $\left\{\frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}\right\}$
   (d) $\left\{\pm\frac{\pi}{12}, \pm\frac{5\pi}{12}\right\}$ (e) None of the above

5. Identify the endpoints of the major axis for the following ellipse.
   $$\frac{(x-1)^2}{25} + \frac{(y+2)^2}{81} = 1$$
   (a) $(1, 7)$ and $(1, -11)$ (b) $(6, -2)$ and $(1, 7)$
   (c) $(6, 7)$ and $(-4, -11)$ (d) $(6, -2)$ and $(-4, -2)$
   (e) none of the above

6. Which of the following expanded the binomial completely
   $$(x + y)^4$$
   (a) $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$ (b) $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 2y^4$
   (c) $x^4 + 2x^3y + 6x^2y^2 + 4xy^3 + y^4$ (d) $x^4 + 3x^3y + 6x^2y^2 + 3xy^3 + y^4$
   (e) none of the above

7. Find the inverse of the one-to-one inverse function.
   $$f(x) = 4x - 5$$
   (a) $f^{-1}(x) = \frac{5+y}{4}$ (b) $f^{-1}(x) = 5x - 4$
   (c) $f^{-1}(x) = 4y - 5$ (d) $f^{-1}(x) = \frac{x+5}{4}$
   (e) none of the above

8. Find the sum of the infinite geometric series:
   $$\frac{9}{4}, \frac{9}{16}, \frac{9}{32}, \ldots.$$

(a) 1 (b) 3 (c) 9 (d) 4
(e) none of the above

9. If $f(x) = 6x - 2$ and if $g(x) = x^2 + 8$. Solve for $f(g(x))$:

(a) $36x^2 - 24x + 12$ (b) $6x^2 - 24x + 12$ (c) $6x^2 + 48$
(d) $6x^2 + 46$ (e) none of the above

10. What is the center and radius of the circle indicated by the equation?

$$(x-2)^2 + y^2 = 36 \tag{1}$$

(a) $(2,0)$, $r = 6$ (b) $(2,0)$, $r = 36$ (c) $(-2,0)$, $r = 36$ (d) $(-2,0)$, $r = 6$
(e) None of the above

11. Find the vertex (x, y) for a parabola with equation

$$y = 3x^2 - 6x + 1 \tag{2}$$

(a) $(1,3)$ (b) $(1,1)$ (c) $(2,-1)$ (d) $(1,-2)$ (e) $(1,2)$

12. Michael scores a 95, 87, 85, 93, and a 94 on his first 5 math tests. If he wants a 90 average, what must he score on the final math test?

(a) 86 (b) 84 (c) 88 (d) 96 (e) 90

13. If David wants to drive to his friend's house, which is 450 miles away, in 6 hours, what is the average speed David has to drive at?

(a) 75 mph (b) 80 mph (c) 50 mph (d) 65 mph
(e) None of the above

14. Find The Limit

$$\lim_{x \to 2} \frac{x^2 + 5x - 14}{x^3 + 1} \tag{3}$$

(a) 9 (b) 0 (c) 2 (d) 14
(e) none of the above

15. Expand

$$(2x - 3)^2 \tag{4}$$

(a) $4x^2 + 3$ (b) $4x^2 - 12x + 9$ (c) $9 + 5x - 4x^2$ (d) $2x^2 - 1$
(e) None of the above

16. A car is moving at a velocity of

$$v(t) = 24 - 3t$$

meters per second, where t is in seconds. How far does the car travel before stopping?

(a) 32 meters (b) 36 meters (c) 40 meters (d) 48 meters
(e) None of the above

17. A cup of coffee initially at $90°C$ cools to $70°C$ after 10 minutes in a room of constant temperature $20°C$. Using Newton's Law of Cooling, what will be the temperature of the coffee after 20 minutes?

(a) $55°C$ (b) $57°C$ (c) $60°C$ (d) $63°C$
(e) None of the above

18. If $\log_4(x) = 3$ and $\log_4(y) = 2$, what is the value of $\log_4\left(\frac{x^2}{y^3}\right)$?

(a) 0 (b) 1 (c) 2 (d) -1 (e) 4

19. If $\log_2(x) = 3$ and $\log_2(y) = 4$, find $\log_2(xy)$.

(a) 12 (b) 7 (c) 8 (d) 6 (e) 5

20. Solve the exponential equation: $2^{x+1} + 2^x = 12$

(a) $x = 1$ (b) $x = 2$ (c) $x = 2.5$ (d) $x = 3$ (e) $x = 3.5$

21. Find the period of the function $f(x) = 3\sin(\frac{2\pi}{5}x)$

(a) 2π (b) $\frac{\pi}{5}$ (c) $\frac{2\pi}{5}$ (d) 5 (e) 10

22. If $\sin\theta = \frac{4}{5}$ and θ is in Quadrant I, find $\cos\theta$

(a) $\frac{3}{5}$ (b) $-\frac{3}{5}$ (c) $\frac{4}{5}$ (d) $-\frac{4}{5}$ (e) 1

23. Find $\lim_{x\to 2} \frac{x^2-4}{x-2}$

(a) 2 (b) 0 (c) 4 (d) -4
(e) Does not exist

24. If $\sin A = \frac{5}{13}$ and $\cos A = \frac{12}{13}$, find $\tan A$

(a) $\frac{12}{5}$ (b) $\frac{5}{12}$ (c) $\frac{13}{12}$ (d) $\frac{13}{5}$ (e) $\frac{12}{13}$