

Solutions to  
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## TEAM QUESTIONS

$$1. A = \lim_{x \rightarrow 0} \frac{x+3}{x^2+6} \quad B = \lim_{x \rightarrow -3} (x+2)^{2001} \quad C = \lim_{x \rightarrow \infty} \frac{x^2-25}{4x^2+4x+1}$$

$$\text{Find } \left(\frac{A}{C}\right)^B$$

$$2. f(x) = x^3 e^x \quad g(x) = \sin^2 x \quad h(x) = x^2 + 5x + 8$$

$$\text{Find } f'(2) + g'\left(\frac{\pi}{4}\right) + h'(-2)$$

3. A particle moves along a line so that at any time  $t$ , its position is given by  $x(t) = \cos(2\pi t) + 2\pi t$ . What is the sum of all values of  $t$ ,  $0 \leq t \leq 4$ , for when the particle is at rest?

4. A group of students arrange a chartered flight from Tampa to St. Thomas for spring break. The round-trip charge is \$499 if a minimum 100 students go. If more than 100 book reservations, the flight charge is reduced \$4 per student over 100. Find the cost per student if and when the maximum revenue is obtained (no partial students).

$$5. f(x) = x^3 + ax^2 + bx + c$$

Find the product of  $a$  and  $b$  for  $f(x)$  that has critical numbers at  $x = -2$  and  $x = 4$ .

$$6. A(x) = 2x^4 + x^2 \quad B(x) = 2x^4 - x^2 + 5 \quad C(x) = x^3 + 3x^2 - 12x + 5$$

Find the exact sum of the  $x$  values that are relative minimums for each function.

$$7. \int_0^a 3t^2 dt = 8 \quad \int_0^b (4u-5) du = 12 \quad \int_c^{2c^2} dv = 15 \quad \int_1^d 2\sqrt{y} dy = \frac{104}{3}$$

Determine the integral values of  $a$ ,  $b$ ,  $c$ , and  $d$  and write as a four-digit number  $abcd$

8. Find the equation of the line (slope-intercept form) parallel to the tangent of the graph of  $f(x) = 4x^3 - 15x + 7$  at  $(-2, 5)$  and through  $(-1, -10)$
9. On a popular sci-fi show, 25 tribbles are beamed on board and continuously reproduce, with no mortalities, at 5% per hour. As acting science officer, you are to report the time needed (hours:seconds, nearest second) for the tribbles to number one million.
10. A 20 inch piece of copper wire is to be cut into 2 pieces, one to form a square and the other to form a circle. How long should the piece of wire be for the circle if the sum of the enclosed areas is to be minimal?

11. Find the area of the region bounded by the graphs  $f(x) = 2x - 1$  and  $g(x) = x^3 - 4x^2 + 5x - 1$
12. A quarterback releases his throw toward a receiver who is 40 yards down field and running parallel to the goal line. In order for the receiver running at 25 feet/sec to catch the pass, the quarterback must throw the ball ahead of the receiver with a velocity of 90 feet/sec. How far ahead of the receiver should the quarterback aim the ball (tenth of a foot)?
13. Find the equation of the normal line to the curve  $y = 2x^3 - 3x + 1$  at  $x = 4$  (standard form).
14. Find the area bounded by the graphs  $y = x + 2$ ,  $y = 3$ ,  $y = -2$ , and  $x = y^2$ .
15.  $f(x) = 2x + 1$ ,  $g(x) = x + 4$ ,  $h(x) = x^2$ . Find  $h'(f(g(-2)))$ .