EMT112 Practice Test II

November 9, 2010

1. Find $\frac{dV}{dr}$ if $V = \frac{4}{3}\pi r^3$
2. Given that the tangent line to the graph of $y = f(x)$ at the point $(2, 5)$ has the equation $y = 3x + 1$, find $f'(2)$.
3. Suppose that the cost of drilling x feet for an oil well is $f(x)$ dollars.
   (a) What are the units of $f'(x)$?
   (b) In practical terms, what does $f'(x)$ mean in this case?
   (c) Estimate the cost of drilling an additional foot , starting at a depth of 300 ft, given that $f'(300) = 1000$.
4. For the following find $\frac{dy}{dx}$.
   (a) $y = \pi^4$
   (b) $y = \frac{x^2+1}{5}$
   (c) $y = x^{-3} + \frac{1}{x^7}$
   (d) $y = (2 - x - 3x^3)(7 + x^5)$
   (e) $y = \frac{3x}{2x+1}$
5. Find the values of x at which the curve $f(x) = (2x + 7)^6(x - 2)^5$ has a horizontal tangent line.
6. What is the angle determined by an arc of length 2π metres on a circle of radius 18 metres?
7. How far does the tip of the minute hand of a clock move in 35 minutes if the hand is 6 inches long?
8. The top of a 200-foot vertical tower is to be anchored by cables that make an angle of 30^o with the ground. How long must the cables be? How far from the base of the tower should anchors be placed?
9. Prove that $\sin(A + B) \cdot \sin(A - B) = \sin^2 A - \sin^2 B$.
10. Two airplanes leave JFK airport in New York at 11 am. The air traffic controller reports that they are traveling away from each other at an angle of 103^o. The DC-10 travels 509 mph and the L-1011 travels at 503 mph. How far apart are they at 11:30 am?

11. To measure the height of the Eiffel Tower in Paris, a person stands away from the base and measures the angle of elevation to the top to be 60^o. Moving 210 feet closer, the angle of elevation to the top of the tower is 70^o. How tall is the Eiffel Tower?

12. Given that $f(x) = 2x - 3$. Find (a) $f^{-1}(x)$ (b) $f^{-1}(-3)$

13. Divide $2x^3 + 5x^2 + 3x + 2$ by $x + 2$.

14. Find the equation of the line that passes through (1,2) and (0,-3).

15. Find the centre and radius of the circle $x^2 + 2x + y^2 - 4y = 4$.

———————ANSWERS———————-

1. $4\pi r^2$ 2. 3 3.(a) Dollars per foot
3(b) The cost of drilling an additional foot 3(c) $1000.
4.(a) 0 (b) $\frac{2x}{5}$ (c) $-3x^{-4} - 7x^{-8}$
4(d) $-24x^7 - 6x^5 + 10x^4 - 63x^2 - 7$ (e) $\frac{3}{(2x+1)^2}$
5. $x \in \{-7/2, -1/2, 2\}$ 6. $\frac{\pi}{9}$
7. 22 inches 8. 400 ft, 346.4 ft
10. 396 miles 11. 984 ft
12. (a) $\frac{x+3}{2}$ (b) 0
13. $2x^2 + x + 1$ 14. $y = 5x - 3$ 15. centre (-1,2) radius = 3