1.   Solve the equation $2^{6-3x} = 8$.

   a. 1   b. −1   c. 2   d. 1   e. 0

2.   Use implicit differentiation to find the slope of the curve

   $2xy^2 - 3y = 2$ at the point (1, 2).

   a. $-\dfrac{8}{5}$ b. $-\dfrac{8}{3}$ c. $-\dfrac{3}{8}$ d. $\dfrac{5}{8}$ e. $-\dfrac{5}{8}$

3. Let x(t) and y(t) be functions of t related by the equation

$$x^3 + y^3 = 2 \ .$$

When x=1, y=1 and $\frac{dx}{dt} = 2$ what is $\frac{dy}{dt}$?

a. −2 b. −1 c. 0 d. 1 e. 2

4. Find the derivative of $f(x) = \frac{e^x - 1}{e^x + 1}$ at x = 0 .

a. $\frac{1}{2}$ b. $\frac{1}{4}$ c. 2 d. −4 e. $-\frac{1}{2}$

5. If $y = \frac{1}{2} u^2 + 2 u^{\frac{1}{2}}$ and u = 1 – 2x   use the chain rule to compute $\frac{dy}{dx}$.

a. $-2 \left\{ (1 - 2x) + \frac{1}{\sqrt{1 - 2x}} \right\}$

b. $-2 \left\{ (1 - 2x) - \frac{2}{\sqrt{1 - 2x}} \right\}$

c. $-2 (1 - 2x) + \frac{1}{\sqrt{1 - 2x}}$

d. $-\frac{1}{2} (1 - 2x) + \frac{2}{\sqrt{1 - 2x}}$

e. $(1 - 2x) + \sqrt{1 - 2x}$

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6.   Find the equation of the tangent line to the curve $y = e^x$ at the point $(1, e)$.

a. $y = ex$ b. $ey + x = 0$ c. $y = e(x - 1)$ d. $y = ex + 1$

e. $ey = x + 1$

7.   Find the derivative of $f(x) = 3x\, e^{x^2}$.

a. $(6x^2 + 3)\, e^{x^2}$ b. $(3x^2 + 6)\, e^{x^2}$ c. $(3 + 2x + 6x^2)\, e^{x^2}$

d. $(x^2 + 2x + 6)\, e^{x^2}$ e. $(3x^2 - 2)\, e^{x^2}$

8. If y is a function of x satisfying $y' - 2y = 0$ and derivative $y'(0) = 3$ then find y.

a. $y = \frac{3}{2} e^{2x}$ b. $y = \frac{3}{2} e^{-2x}$ c. $y = \frac{2}{3} e^{-2x}$ d. $y = \frac{2}{3} e^{2x}$ e. $y = \frac{1}{2} e^{2x}$

9. Solve the equation $\ln(\ln 3x) = 0$.

a. $\frac{e}{3}$ b. e^3 c. e^{-3} d. $-\frac{e}{3}$ e. $\frac{1}{3}$

10. Solve the equation $\ln(x^2 + 2x + 2) = 0$.

a. -1 b. -2 c. 0   d. 2   e. 1

11. Find the derivative of $f(x) = \ln\left((x+1)^{100}\right)$.

a. $\dfrac{100}{x+1}$ b. $\dfrac{99}{x+1}$ c. $100(x+1)$ d. $99(x+1)$ e. $100\ln(x+1)^{99}$

12. The function $f(x) = \dfrac{\ln x}{x}$, defined for $x > 0$,   has one relative extreme point.   Find the x – ordinate of this point.

   a. e   b. $\dfrac{1}{e}$ c. e – 1   d. $\dfrac{1}{e-1}$ e. ln 2

13.   Find the derivative of $f(x) = \ln\left(\dfrac{x}{x-3}\right)$.

   a. $\dfrac{1}{x} - \dfrac{1}{x-3}$ b. $\dfrac{1}{x-3} - \dfrac{1}{x}$ c. $\dfrac{-3}{(x-3)^2}$ d. $\dfrac{x-3}{x}$ e. $\dfrac{1}{(x-3)^2}$

14. Find the derivative of $f(x) = \ln(x^3(x + 1)^4)$.

a. $\dfrac{3}{x} + \dfrac{4}{x + 1}$

b. $\dfrac{3}{x} + \dfrac{12}{x + 1}$

c. $\dfrac{1}{x^3} +$ $\dfrac{1}{(x + 1)^4}$

d. $3x + 4(x + 1)$

e. $x^3 + (x + 1)^4$.

15. Find the derivative of the composite function $f \circ g(x)$ where

$f(x) = \dfrac{x^5}{5} + \dfrac{x^3}{3}$ and $g(x) = \sqrt{x}$.

a. $\dfrac{x^2 + x}{2\sqrt{x}}$

b. $\dfrac{x^4 + x^2}{2\sqrt{x}}$

c. $\dfrac{5x^4 + 3x^2}{2\sqrt{x}}$

d. $\dfrac{x^4 + x}{2\sqrt{x}}$

e. $\dfrac{x^2 + 2x}{2\sqrt{x}}$

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16. A population of bacteria is given by $P(t) = 10\ e^{kt}$ where t denotes time measured in seconds and k is some constant. If after 10 seconds the population is 30 cells find the value of k.

a. $\dfrac{\ln 3}{10}$
b. $\dfrac{10}{\ln 3}$
c. $\dfrac{\ln 10}{3}$
d. $\ln \dfrac{3}{10}$
e. $\ln 3$

17. If $P(t) = 500\ e^{\frac{t}{100}}$ find for what t the value of P is 1000.

a. $100 \ln 2$
b. $2 \ln 100$
c. $\ln 200$
d. 200
e. $5 \ln 2$

18.   The growth rate of a certain cell culture is proportional to its size. In 6 hours the cell population grows from one million to two million. How large will the cell population be after one day?

a. 16 million   b. 12 million   c. 8 million

d. 6 million   e. 4 million

19.   The half life of Strontium–90 is 30 years. How long will it take for a given quantity to diminish to one tenth of its present amount?

a. $30 \frac{\ln 10}{\ln 2}$ b. $30 \ln 5$ c. $10 \frac{\ln 30}{\ln 2}$

d. $\frac{\ln 10}{\ln 2}$ e. $\frac{\ln 10}{\ln 2} \ln 30$

20.   If interest is compounded continuously at a rate of 10% how many years will it take for an investment of $1000 to double?

       a. 10 ln2   b. 2 ln10   c. ln 2 ln10   d. 2^5 e. 10