1. The equation of the line passing through the points (0,2) and (3, –7) is:

   a. $y = 2x - 7$
   b. $y = 7x + 2$
   c. $y = -3x + 2$
   d. $y = x + 1$
   e. $y = 7x - 3$

2. The equation of the tangent line at x=2 to the curve $y = (2x - 5)^{12}$ is

   a. $y = -12x + 25$
   b. $y = 12x + 23$
   c. $y = x - 1$
   d. $y = -x + 1$
   e. $y = -24x + 49$

3. Let $f(x) = x^4 + x^2 + 1$ and $g(x) = \frac{1}{\sqrt{x}}$. Then $f(g(x)) =$

a. $\frac{1}{\sqrt{x^4+x^2+1}}$ b. $x^2 + x + 1$

c. $\sqrt{x^4 + x^2 + 1}$ d. $\frac{1}{x^2} + \frac{1}{x} + 1$ e. $\frac{1}{\sqrt{x^2 + x + 1}}$

4. The point of inflection of $y= -x^3 + 6x^2 - 1$ occurs at $x =$

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

5. The half life of a radioactive element is 1000 years. Its decay constant is

a. $\frac{\ln 1000}{\ln 2}$ b. $\frac{1000}{\ln 2}$ c. $\frac{\ln 2}{1000}$ d. $\frac{\ln 2}{\ln 1000}$ e. $\frac{2}{\ln 1000}$

6. Find the slope of the curve defined by the equation

$y^{3/2} + 2x^3 + y + 4 = 0$

at the point $x = -2$, $y = 4$ on the curve,

a. -6 b. $\frac{2}{3}$ c. $-\frac{2}{3}$ d. $\frac{5}{3}$ e. 6

7. Let $f(x) = \sqrt{x}$.

Use the first derivative of $f(x)$ to find an approximate value of $\sqrt{15.8}$.

a. $\frac{190}{48}$ b. $\frac{1300}{327}$ c. $\frac{780}{196}$ d. $\frac{159}{40}$ e. $\frac{160}{41}$

8. Let $f(x) = \ln [(x + 1)(x^2 + 1)(x^3 + 1)]$. Then $f'(x) =$

a. $\ln (x + 1) + \ln (x^2 + 1) + \ln (x^3 + 1)$ b. $\frac{1}{x + 1} + \frac{1}{x^2 + 1} + \frac{1}{x^3 + 1}$

c. $\frac{1}{(x + 1)(x^2 + 1)(x^3 + 1)}$ d. $\frac{1}{x + 1} + \frac{x}{x^2 + 1} + \frac{x^2}{x^3 + 1}$

e. $\frac{1}{x + 1} + \frac{2x}{x^2 + 1} + \frac{3x^2}{x^3 + 1}$

9. Find all of the solutions of $e^{x^2 - x} = e^6$

a. $x = 3, x = -2$ b. $x = -3, x = 1$ c. $x = -3, x = -1$

d. $x = -1$ e. $x = 0$

10. The slope of the curve $y = x \ln x$ at $x = 1$ is:

a. $\frac{1}{3}$ b. 2 c. 0 d. 1 e. ln 2

11. $f(x) = x^3 - x^2 + 4$: Find the largest value of $f(x)$ on the closed interval $[-1, 2]$

a. 4 b. 3.8 c. 8 d. 16 e. 6

12. A particle moves along the x axis in such a way that its instantaneous velocity

$$v(t) = -3t^2 + 8t + 5.$$

Find the value of its acceleration at $t = 2$.

a. -12 b. -4 c. 9 d. 5 e. 0

13. A function $f(x)$ has derivative given by

$$f'(x) = x(x-1)(x+1),$$

The function f is increasing on the interval

a. $(0,1)$ b. $(-1,0)$ c. $\left(-\frac{1}{2}, \frac{1}{2}\right)$ d. $(-1,1)$ e. $\left(\frac{1}{2}, 1\right)$

14. Let $f(x) = 2x^3 - 3x + 4$ and let x be a function of t such that $\frac{dx}{dt} = -2$ when $x = 2$. If $y = f(x(t))$ find $\frac{dy}{dt}$ when $x = 2$.

a. -42 b. 42 c. 16 d. 14 e. -14