

BC CALCULUS SUMMER WORK

1. 10 integration problems. Do on **separate paper**, showing **ALL** work. No calculators. There is a page with “hints” on most of these if needed.
2. 84 multiple choice questions. You should have room on the worksheet to do your work next to the problem. Circle your letter choice. Show all work. No Calculator!
3. All of the above is due on the first day of class in August. Do not wait until the last minute to start this. You may want to use your book to look things up if needed or your old class notes.

Review of Integration – BC

Evaluate each of the following integrals.

1. $\int (x + 2)\sin(x^2 + 4x - 6) dx$

2. $\int_{-1}^1 \frac{dx}{\sqrt{(x+2)(3-x)}}$

3. $\int_0^{\frac{1}{\sqrt{2}}} \frac{x \sin^{-1} x^2 dx}{\sqrt{1-x^4}}$

4. $\int \frac{x dx}{\sqrt{x^2 + x + 1}}$

5. $\int_1^2 \frac{dx}{(x^2 - 2x + 4)^{\frac{3}{2}}}$

6. $\int_e^{e^2} \frac{dx}{x(1 + \ln x)^3}$

7. $\int x^n \ln x dx, n \neq -1$

8. $\int 3^{\sqrt{2x+1}} dx$

9. $\int_0^1 x \ln(x + 3) dx$

10. $\int \frac{6-x}{(x-3)(2x+5)} dx$

Hints for Review of Integration (if needed)

2. complete the square, then use trig substitution

3. use the form $\int u \, du = \frac{1}{2}u^2$

5. same idea as #2

6. use the form $\int u^n \, du = \frac{1}{n+1}u^{n+1}$

7. integration by parts

8. u-substitution

9. integration by parts

10. partial fractions

Miscellaneous Multiple Choice

1. If $f(x)$ is everywhere differentiable and $f(x) = -f(-x)$, which of the following must be true?

- (A) $f(x) = \sin x$
 - (B) $f(x) = \cos x$
 - (C) $f'(x) = f'(-x)$
 - (D) $f'(x) = -f'(-x)$
 - (E) None of these
-

2. If $\frac{dy}{dt} = t^2 - t - 1$ and if $y = 0$ when $t = 1$, what is the value of y when $t = 0$?

- (A) $\frac{7}{6}$
 - (B) $\frac{8}{7}$
 - (C) $-\frac{4}{5}$
 - (D) $\frac{1}{2}$
 - (E) $\frac{4}{7}$
-

3. If $x = t^3 - 3t$ and $y = (t^2 + 1)^2$, then at $t = 2$, $\frac{dy}{dx}$ is

- (A) 40
- (B) 9
- (C) $\frac{40}{9}$
- (D) $\frac{9}{40}$
- (E) 0

4. The substitution $u = \ln x$ transforms the integral $\int_1^e \frac{1-\ln x}{x^2} dx$ into

(A) $\int_0^1 (1-u) du$

(B) $\int_0^1 (1-u)e^u du$

(C) $\int_0^1 (1-u)e^{-u} du$

(D) $\int_1^e (1-u) du$

(E) $\int_1^e (1-u)e^{-u} du$

5. $\lim_{x \rightarrow \pi} \frac{\cos x + 1}{x - \pi} =$

(A) 0

(B) 1

(C) π

(D) -1

(E) $\frac{\sqrt{2}}{2}$

6. An antiderivative of $x^{\frac{x}{\ln x}}$ is

(A) $x^{\frac{x+1}{\ln x}}$

(B) $x^{\frac{x}{\ln x}}$

(C) $x^{\frac{1}{x \ln x}}$

(D) $x^{\frac{\ln x}{x}}$

(E) $x^{\left(\frac{x}{\ln x} + x \ln x\right)}$

7. Let V be the volume of the region bounded between two expanding concentric spheres. At time $t = 0$ the spheres have radii 6cm and 40cm. The radius of the smaller sphere increases at 8 cm/sec while the radius of the larger sphere increases at 2cm/sec. The volume V will be maximal at $t =$

(A) $\frac{1}{2}$

(B) 1

(C) 2

(D) $\frac{3}{2}$

(E) 3

8. At each pair (x,y) on a certain curve, the slope of the tangent line to the curve is given by $2x\sqrt{1-y^2}$. If the curve contains the point $(0,1)$, then its equation is:

(A) $y = \sin(x + \frac{\pi}{2})$

(B) $y = 1 + \sin x$

(C) $y = 1 + \sin(x^2)$

(D) $y = \cos(x^2)$

(E) $y = x^2 \cos x$

9. An equation of the line normal to the graph of $y = x^4 - 3x^2 + 1$ at the point where $x = 1$ is:

(A) $2x - y + 3 = 0$

(B) $x - 2y + 3 = 0$

(C) $2x - y - 3 = 0$

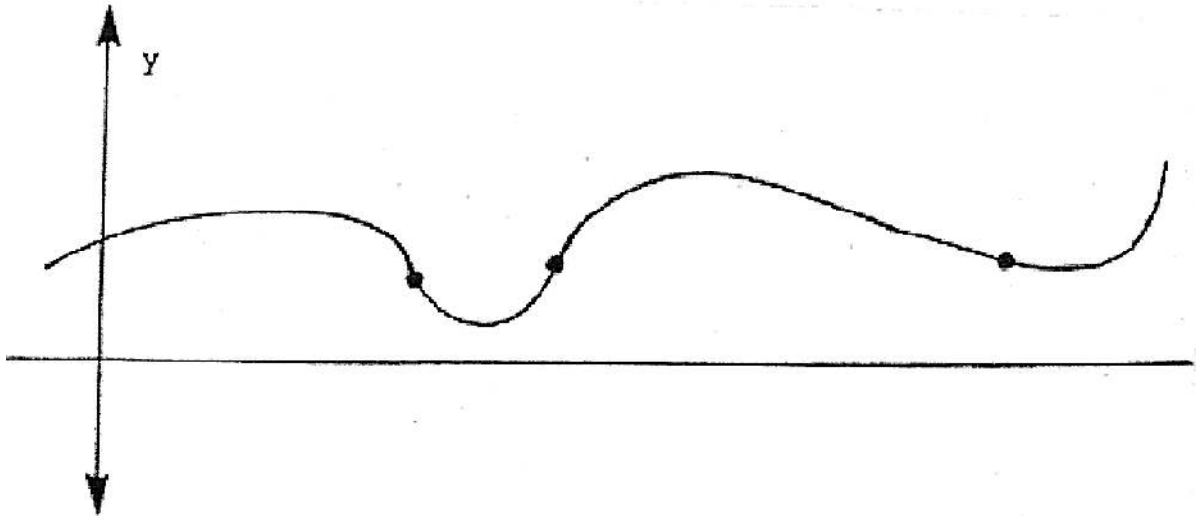
(D) $x - 2y - 3 = 0$

(E) $x - 2y = 0$

10. A particle moves along the x-axis so that its position at time t is given by $x(t) = (1 + t^2)e^{-t}$.
For what values of t will the particle be at rest?

- (A) No values
 - (B) 0 only
 - (C) $\frac{1}{2}$ only
 - (D) 1 only
 - (E) 2 only
-

11.



How many inflection points does the curve shown above have?

- (A) 0
 - (B) 1
 - (C) 2
 - (D) 3
 - (E) 4
-

12. $\lim_{x \rightarrow 0^+} [e^{x^2 + \ln x}] =$

- (A) 0
 - (B) 1
 - (C) e
 - (D) e^2
 - (E) e^e
-

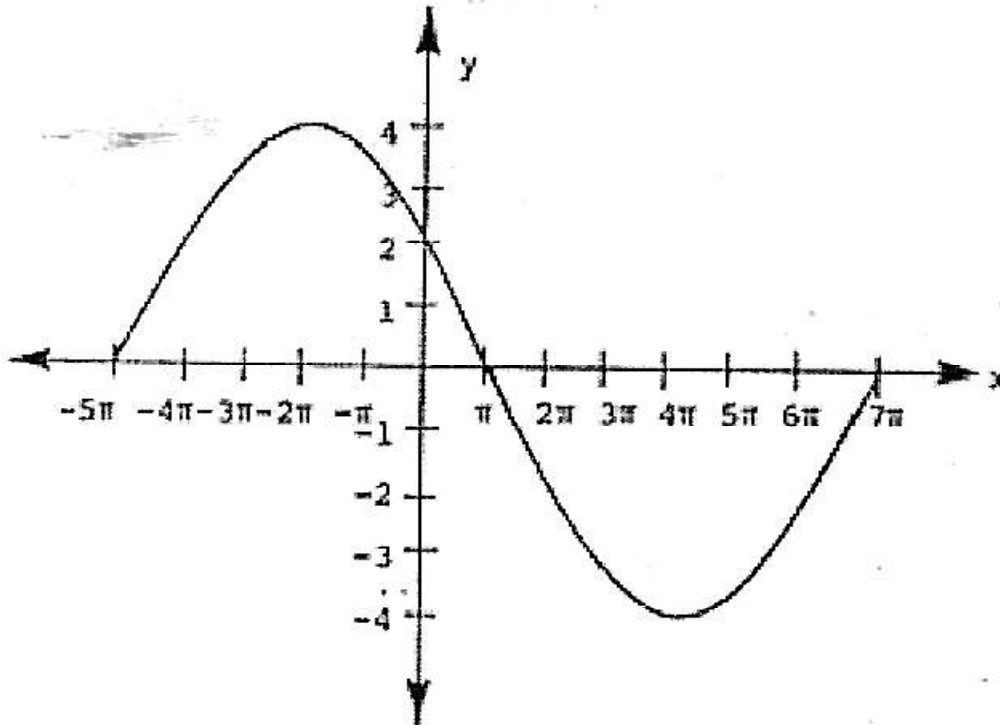
13. If the velocity of a particle moving along the x - axis is $v(t) = 3t^2 - 5$, and if the particle is at $x = 9$ when $t = 1$, then its position function $x(t)$ is:

- (A) $6t + 3$
 - (B) $t^3 - 5t$
 - (C) $3t^2 + 6$
 - (D) $t^3 - 5t + 9$
 - (E) $t^3 - 5t + 13$
-

14. If $f(x) = x^2 \ln(x^3)$, then $f'(x) =$

- (A) $3x + \ln x^3$
 - (B) $3x(1 + \ln x^2)$
 - (C) $\frac{1}{x}$
 - (D) $2x$
 - (E) $2x \ln(3x^2)$
-

15.



The curve shown above is the graph of :

- (A) $y = 4 \sin(6x + 5\pi)$ (D) $y = 4 \sin \frac{x-5\pi}{6}$
- (B) $y = 4 \sin 6(x + 5\pi)$ (E) $y = 4 \sin \left(\frac{x}{6} - 5\pi \right)$
- (C) $y = 4 \sin \left(\frac{x}{6} - 5\pi \right)$

16. At what value of x does $f(x) = 2x^2 - 5x^4 - 10x^3 + 8$ have a relative maximum?

- (A) -3 (E) -1
- (B) -2
- (C) 0
- (D) 2

17. $\frac{d}{dx} \ln\left(\frac{1+x^2}{1-x^2}\right) =$

(A) $\frac{1}{1-x^2}$

(B) $\frac{2x}{1-x^2}$

(C) $\frac{1}{1-x^4}$

(D) $\frac{4x}{1-x^4}$

(E) $\frac{-4x}{1-x^4}$

18. If $y = x \sin(x + y)$, then $\frac{dy}{dx} =$

(A) $\sin(x + y) + x \cos(x + y)$

(B) $\sin(x + y) - x \cos(x + y)$

(C) $\frac{\sin(x+y) + x \cos(x+y)}{1+x \cos(x+y)}$

(D) $\frac{\sin(x+y) - x \cos(x+y)}{1+x \cos(x+y)}$

(E) $\frac{\sin(x+y) + x \cos(x+y)}{1-x \cos(x+y)}$

19. $\lim_{h \rightarrow 0} \frac{\sqrt{1+h} + \sqrt{1-h} - 2}{h^2} =$

(A) 0 (D) $-\frac{1}{4}$

(B) $\frac{1}{2}$ (E) Does not exist

(C) $\frac{1}{4}$

20. If $y' e^x = x e^y$ and $y(0) = 0$, then $y =$

- (A) $x e^x$
 - (B) $x - \ln(1 + x)$
 - (C) $\frac{x}{(x+1)e^x}$
 - (D) $x - \ln(1 + x + e^x)$
 - (E) $-x - \ln(1 + x)$
-

21. $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan x - 1}{\sin x - \cos x} =$

- (A) 1
 - (B) $\sqrt{2}$
 - (C) 2
 - (D) $2\sqrt{2}$
 - (E) Does not exist
-

22. The curves $y = \frac{x^2}{2}$ and $y = 1 - \frac{x^2}{2}$ intersect in the first quadrant. The angle at which they intersect is

- (A) 30°
 - (B) 45°
 - (C) 60°
 - (D) 90°
 - (E) 0°
-

23. If $y = e^x \cos 2x$ then $y'' - y =$

(A) $-4e^x \sin 2x - 4e^x \cos 2x$

(B) $e^x \sin 2x$

(C) $e^x \cos 2x$

(D) $2e^x \cos 2x + 4e^x \sin 2x$

(E) $2e^x \sin 2x + 4e^x \cos 2x$

24. The function $f(x) = |x^3 - 3x|$ has relative minima at how many points?

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

25. Which of the following functions is not continuous at $x = 0$?

I. $f(x) = |x|$

(A) I and II only

II. $f(x) = \begin{cases} \frac{\sin x}{x} & \text{when } x \neq 0 \\ 1 & \text{when } x = 0 \end{cases}$

(B) I and IV only

III. $f(x) = x^2$

(C) II only

IV. $f(x) = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ -1 & \text{if } x < 0 \end{cases}$

(D) IV only

(E) None

26. If $y^2 = x + y^3 y' =$

(A) $1 + 3y^2$

(B) $\frac{1}{2y-3y^2}$

(C) $\frac{2x}{3-y^2}$

(D) $\frac{1}{2y(1+y^2)}$

(E) $\frac{1}{2y(1+3y^2)}$

27. $\frac{d}{dy} \left(y^2 \ln \left(\frac{1}{y^2} \right) \right) =$

(A) $-2y \ln(y^2) - 2y$

(B) $-4y \ln y - 2y$

(C) $2y \ln \frac{1}{ey^2}$

(D) $-2y (1 + 2 \ln y)$

(E) All of the above

28. $\lim_{h \rightarrow 0} \frac{\sqrt{1+2h} - 1}{h} =$

(A) 2

(D) 0

(B) 1

(E) Does not exist

(C) $\frac{1}{2}$

29. If $y = 3x^2 \sin x$ and $x = \sqrt{t}$ then $\frac{dy}{dt} =$

- (A) $6t \sin \sqrt{t}$
 - (B) $6t \cos \sqrt{t}$
 - (C) $3 \sin \sqrt{t} + \frac{3}{2} \sqrt{t} \cos \sqrt{t}$
 - (D) $\frac{3}{2} \sin \sqrt{t} + 3 \cos \sqrt{t}$
 - (E) $3(\sqrt{t} \sin \sqrt{t} + \cos \sqrt{t})$
-

30. A six foot tall clown is leaning against a lamp post when his feet start sliding out at the rate of one foot/second. How fast is his head sliding down the post when his feet are 5 feet out?

- (A) $5/\sqrt{11}$
 - (B) $5\sqrt{11}$
 - (C) 5
 - (D) $\sqrt{11}$
 - (E) None of these
-

31. At how many points on the curve $y = x^4 - x^2$ is the normal to the curve

perpendicular to the line $y = 2x$?

- (A) 0 (D) 3
- (B) 1 (E) 4
- (C) 2

32. The maximum value of x^2e^x on $\left[-3, \frac{1}{2}\right]$ is:

(A) $\frac{\sqrt{e}}{4}$

(B) $\frac{4}{e^2}$

(C) $\frac{4}{e}$

(D) $2e^{-\sqrt{2}}$

(E) $9e^{-3}$

33. If $xy = x + y$, what is y' when x is -1 ?

(A) $\frac{1}{2}$

(B) $-\frac{1}{4}$

(C) $\frac{1}{4}$

(D) $-\frac{1}{2}$

(E) Cannot be determined

34. $\lim_{x \rightarrow 1} \frac{\tan^{-1}x - \tan^{-1}1}{x-1} =$

(A) -1 (E) 1

(B) $-\frac{1}{2}$

(C) 0

(D) $\frac{1}{2}$

35. A square is inscribed in a circle. How fast is the area of the square changing when the area of the circle is increasing one square inch per minute?

(A) $\frac{1}{2} \text{ in}^2 \text{ min}$

(B) $1 \text{ in}^2 / \text{min}$

(C) $\frac{2}{\pi} \text{ in}^2 \text{ min}$

(D) $\frac{\pi}{2} \text{ in}^2 / \text{min}$

(E) Cannot be determined

36. $\lim_{x \rightarrow 2} \frac{e^x - e^2}{x - 2} =$

(A) 0

(B) e

(C) e^2

(D) e^{-1}

(E) None of these

37. $\lim_{x \rightarrow 0} (x \ln x)$ is:

(A) 0

(B) e^3

(C) $\ln 3$

(D) 1

(E) Nonexistent

38. If the motion of a particle on the x-axis has acceleration $\frac{d^2x}{dt^2} = t^2 - 2t$, and it is stationary at 1 when $t = 1$, then $12x(t) =$

- (A) $t^4 + 4t^3$
 - (B) $t^4 - 4t^3 + 8t + 7$
 - (C) $4t^4 + 8t^3$
 - (D) $t^4 - 4t^3 + 15t^2$
 - (E) $t^4 - 2t^3 + 3t^2 - 4t + 14$
-

39. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$ is:

- (A) 0
 - (B) $\frac{1}{2}$
 - (C) 1
 - (D) 2
 - (E) Nonexistent
-

40. The maximum value of $2x + y$ on the circle $(x^2 + y^2 = 4)$ is:

- (A) 4
 - (B) $2\sqrt{5}$
 - (C) $3\sqrt{3}$
 - (D) 5
 - (E) 6
-

41. $\lim_{h \rightarrow 0} \frac{e^{1+h} - e}{h} =$

- (A) 0
 - (B) $\frac{1}{e}$
 - (C) 1
 - (D) E
 - (E) Does not exist
-

42. $\lim_{x \rightarrow 0} \frac{\sin 2x - 2x}{x^3} =$

- (A) Does not exist
 - (B) 1
 - (C) $-\frac{4}{3}$
 - (D) ∞
 - (E) $-\infty$
-

43. Which of the following functions shows that the statement "If a function is continuous at $x = 0$, then it is differentiable at $x = 0$ " is False?

- (A) $f(x) = x^{\frac{-2}{3}}$
 - (B) $f(x) = x^{\frac{-3}{2}}$
 - (C) $f(x) = x^{\frac{4}{3}}$
 - (D) $f(x) = x^4$
 - (E) $f(x) = x^{\frac{2}{3}}$
-

44. The derivative of $10^{(\cos x)}$ is:

- (A) $10^{(\cos x)} (-\sin x)$
 - (B) $10^{(\cos x)} \ln 10(\cos x)$
 - (C) 0
 - (D) $10^{(\cos x)} \ln(-\sin x)$
 - (E) $10^{(\cos x)} \ln 10(-\sin x)$
-

45. How many relative or absolute maxima does $x - \cos x$ have on the interval

$(-2\pi, 2\pi)$?

- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
 - (E) 5
-

46. Find $y(2)$ if $y(0) = 1$ and $y'(x) = 2x + 3$

- (A) 11
 - (B) 10
 - (C) 9
 - (D) 8
 - (E) 7
-

47. A particle moves along the x-axis so that at any time, t , its position is given by $x(t) = t e^{\frac{-t}{2}}$. For what value of t is the particle at rest?

(A) 2

(B) 0

(C) $\frac{1}{2}$

(D) 1

(E) $\frac{\pi}{2}$

48. $\frac{d}{dx}(x^2 + 3x e^{2x}) =$

(A) $2x + 6xe^{2x} + 3e^x$

(B) $2x + 6xe^{2x}$

(C) $2x + 6xe^{2x} + 3e^{2x}$

(D) $2x + 3e^{2x}$

(E) None of the above

49. The line normal to the curve $y = 3x^2 + 5$ at the point $(1,8)$ contains the point

(A) $(0,8)$

(B) $(13,6)$

(C) $(10,9)$

(D) $(-9,9)$

(E) $(22,6)$

50. If $x^2 y^2 + 2x - y = 0$, $y'(1) =$

- (A) -4
- (B) 2
- (C) 0
- (D) Cannot be determined
- (E) Does not exist

51. An equation of the line normal to the graph of $y = 7x^4 + 2x^3 + x^2 + 2x + 5$ at the point where $x = 0$ is

- (A) $X + 2y = 10$
- (B) $2x + y = 10$
- (C) $5x + 5y = 2$
- (D) $2x - y = -5$
- (E) $2x + y = -10$

52. At what value of x does $f(x) = \frac{x^3}{3} - x^2 - 3x = 5$ have a relative minimum?

- (A) -1 only
 - (B) 0 only
 - (C) 1 only
 - (D) 3 only
 - (E) -1 and 3
-

53. The function $f(x) = x^3 + ax$ has one minimum and one maximum:

- (A) Never
 - (B) Always
 - (C) When $a > 0$
 - (D) When $a < 0$
 - (E) When $a = 0$
-

54. The function $f(x) = \frac{\sin 2x}{x}$ is continuous for $x \neq 0$. We can make it continuous on

\mathbb{R} by setting $f(0) =$

- (A) We can't
 - (B) 1
 - (C) 0
 - (D) -1
 - (E) 2
-

55. $\frac{d}{dx}(e^{x^2}) =$

- (A) e^{x^2}
 - (B) $-e^{x^2}$
 - (C) $2xe^{x^2}$
 - (D) $\frac{2e^x}{x}$
 - (E) $\frac{e^{x^2}}{2x}$
-

56. A funnel is in the shape of a circular cone with the height equal to the diameter (Both 6 inches). Liquid is being poured through it at the rate of 2 cubic inches per minute when it becomes clogged. How fast is the level of liquid rising when it is 2 inches deep?

- (A) $\frac{1}{\pi}$ in/min
- (B) $\frac{2}{\pi}$ in/min
- (C) 1 in/min
- (D) $\frac{\pi}{2}$ in/min
- (E) π in/min

57. If y is a function of x , $y' = y^2$ and $y(1) = 1$, then $y =$

- (A) $\frac{1}{x}$
- (B) $\frac{1}{2-x}$
- (C) $\frac{1}{1-x}$
- (D) $\frac{1}{x^2}$
- (E) $\frac{2}{1+x}$

58. If $f(x) = \frac{x}{\cot x}$, then $f'(\frac{\pi}{4}) =$

- (A) $1 - \frac{\pi}{2}$
- (B) $1 + \frac{\pi}{2}$
- (C) $\frac{\pi}{2} - 1$
- (D) 2
- (E) $\frac{3}{4}$

59. Let $e^x \ln \sin x = f(x)$. Then $f'(x) =$

- (A) $f(x)$ (D) $f(x) + e^x \cot x$
(B) $f(x) - e^x \tan x$ (E) $e^x \cot x$
(C) $f(x) + e^x \tan x$
-

60. Let $x = e^{xy} + y$. Then $y' =$

- (A) $1 - e^{xy}$
(B) $1 - y e^{xy}$
(C) $\frac{1+ye^{xy}}{1+xe^{xy}}$
(D) $\frac{1-ye^{xy}}{1+xe^{xy}}$
(E) exy
-

61. If $y = x^2 \sin x$, $y' =$

- (A) $2x \cos x$
(B) $2x \sin x + x^2 \sin x$
(C) $2x \sin x + x^2 \cos x$
(D) $2x \sin x - x^2 \cos x$
(E) None of these
-

62. What is the acceleration of the particle which has position $x(t) = 2t \sin t$, when

$$t = \frac{\pi}{2}?$$

- (A) π (D) -2
(B) $-\pi$ (E) 0
(C) 2

63. An ellipse with semiaxes a and b has area πab . If the area is 9π (held constant), how fast is b increasing when $a = 1$ and a is decreasing at $\frac{1}{2}$ units/minute?
- (A) $4\frac{1}{2}$ units/minute
(B) $\frac{2}{9}$ units/minute
(C) 3π units/minute
(D) 3 units/minute
(E) Cannot tell

-
64. If the movement of a particle in the plane is $x(t) = \sin t$, $y(t) = \cos^2 t$, and t is in the interval $[0, \pi]$, when is it stationary? (Hint: both $x'(t)$ and $y'(t)$ must equal 0 for vel. = 0)
- (A) 0
(B) $\frac{\pi}{2}$
(C) $\frac{\pi}{4}$
(D) $\frac{3\pi}{4}$
(E) π

65. $\frac{d}{dx}(x^4 \ln(4x^4)) =$

- (A) $4x^3 \ln(4x^4)$ (D) $4x^3 (\ln(4x^4) + 1)$
(B) $16x^3 \ln(4x)$ (E) $4x^3$
(C) $4x^3 (4\ln(4x^4) + 4)$

66. If $y = x^{x^2}$, then $y' =$

- (A) $x^{x^2} (x + 2x \ln x)$
- (B) $2x^{x^2+1}$
- (C) $y(x + 2 \ln x)$
- (D) $2x \ln x + x$
- (E) None of the above

67. If f is a function such that $\lim_{x \rightarrow 5} \frac{f(x) - f(5)}{x - 5} = 0$, which of the following must be true?

- (A) The limit of $f(x)$ as x approaches 5 does not exist.
- (B) $f(5) = 0$
- (C) f is continuous at $x = 0$
- (D) f' at $x = 5$ is 0
- (E) f is not defined at $x = 5$

68. The function $f(x) = |x^2 - 2x|$ has a relative minimum at which values of x ?

- (A) 1
 - (B) 0
 - (C) 2
 - (D) 0 and 2
 - (E) 0, 1, and 2
-

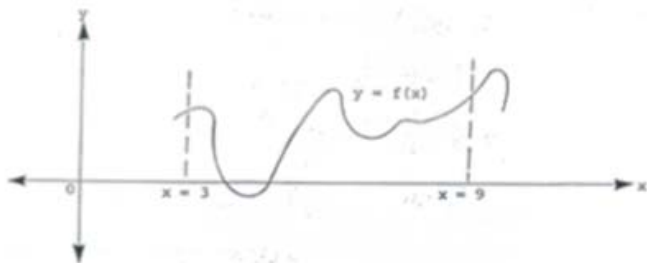
69. If $y = x^2 + 3x + 5$ and $x = \sin t$, what is $\frac{dy}{dx}$ when $t = \pi$?

- (A) 0
 - (B) 3
 - (C) 2
 - (D) -3
 - (E) 1
-

70. Which of the values of x below are minima for $f(x) = x^3 - 3x$ on the interval $[-2,2]$?

- (A) -2
 - (B) 1
 - (C) -1
 - (D) -2 and -1
 - (E) -2 and 1
-

71. The graph of $y = f(x)$ on the closed interval $[3,9]$ is shown below. How many points of inflection does the graph have on this interval?



- (A) 2
- (B) 3
- (C) 4
- (D) 5
- (E) 6

72. At each point (x,y) on a curve, the slope of the curve is $3x^2(y - 6)$. If the curve contains the point $(0, 7)$, then its equation is:

(A) $y = 6e^{x^3}$

(B) $y = x^3 + 7$

(C) $y = 6e^{x^3} + 7$

(D) $y^2 = x^3 + 6$

(E) $y = e^{x^3} + 6$

73. If $x^3 + 2x^2y^2 + xy = 7$, then at the point $(1,1)$, y' is

(A) -1

(B) $\frac{4}{5}$

(C) $-\frac{4}{5}$

(D) $-\frac{8}{5}$

(E) 0

74. Given that $x'(t) = t^2 + 3t$ and $x(1) = 5$, what is $x(t)$?

(A) $2t + 3$

(B) $\frac{1}{3}t^3 + \frac{3}{2}t^2$

(C) $\frac{1}{2}t^3 + 3t^2 + \frac{3}{2}$

(D) $\frac{1}{3}t^3 + \frac{3}{2}t^2 + \frac{19}{6}$

(E) Cannot be determined

75. If a particle moves on the x-axis according to $x(t) = 2t - t^2$, how far to the right will it get?

- (A) 1
- (B) 0
- (C) -1
- (D) 2
- (E) -2

76. A particle moves in the xy-plane so that at any time, t , its coordinates are

$x = t^3 - t^2$ and $y = t^4 - 5t^2$. At $t = 1$ its acceleration vector is:

- (A) $\langle 0, 4 \rangle$
- (B) $\langle 0, 2 \rangle$
- (C) $\langle 2, 4 \rangle$
- (D) $\langle -4, -2 \rangle$
- (E) $\langle 4, 2 \rangle$

77. If $x = t^2 + 2t$ and $y = 3 \ln(t + 1)$, then $\frac{dy}{dx}$ at $t = \frac{1}{2}$ is

- (A) $\frac{2}{3}$
- (B) $\frac{4}{5}$
- (C) $\frac{3}{2}$
- (D) 3
- (E) $\frac{1}{2}$

78. If $2x^3 + 3xy + e^y = 6$, what is y' when $x = 0$?

- (A) $\frac{1}{2} \ln 6$
- (B) $-\frac{1}{2} \ln 6$
- (C) $\ln 6$
- (D) $-\ln 6$
- (E) 0

79. If $y = f(x) = x^3 + \ln x$, what is y' ?

- (A) $3x^2 \ln x + x^3$
- (B) $\frac{1}{4} x^4 + \frac{1}{x}$
- (C) $3x^2 + \frac{1}{x}$
- (D) $3x^2 + x \ln x$
- (E) None of the above

80. If the velocity of a particle moving along the x -axis is $v(t) = 3t^2 + 5$, and if at $t = 0$, its position is 4, then at any time t its position $x(t)$ is

- (A) $6t + 4$
- (B) $3t^2 + 5$
- (C) $3t^3 + 5t - 4$
- (D) $t^3 + 5t + 4$
- (E) $t^3 + 5t - 4$

81. equation of the line tangent to the curve $x(t) = t^3$, $y(t) = 1 - t$, at the point

(8, -1) is:

(A) $x + 12y = -4$

(B) $12x + y = 4$

(C) $3x - y = 2$

(D) $x + y = 4$

(E) $x - 4y = 2$

82. Find the derivative of $\cos^3 2x$.

(A) $3 \cos^2 2x$

(B) $-6\cos^2 2x \sin 2x$

(C) $3 \sin^2 2x$

(D) $-3\sin^2 2x \sin 2x$

(E) $3 \cos 2x \sin 2x$

83. If $x, y > 0$ and $y' = xy$, then $y =$

(A) Ke^x

(B) Ke^{x^2}

(C) Kx^2

(D) $Ke^{\frac{x^2}{2}}$

(E) Ke^{2x^2}

84. If $f(x) = x^2 \ln(x^3)$, then $f'(x) =$

(A) $3x + \ln(x^3)$

(B) $\frac{1}{x}$

(C) $\frac{1}{x^2}$

(D) $\frac{1}{x} + 2x \ln(x^3)$

(E) $3x + 2x \ln(x^3)$