BC Parametrics Test Review

1. For $0 \leq t \leq 13$, an object travels along an elliptical path given by the parametric equations $x = 3\cos t$ and $y = 4\sin t$. At the point where $t = 13$, the object leaves the path and travels along the line tangent to the path at that point. What is the slope of the line on which the object travels?

(A) $-\frac{4}{3}$

(B) $-\frac{3}{4}$

(C) $-\frac{4\tan 13}{3}$

(D) $-\frac{4}{3\tan 13}$ ✔

(E) $-\frac{3}{4\tan 13}$

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2. A curve C is defined by the parametric equations $x = t^2 - 4t + 1$ and $y = t^3$. Which of the following is an equation of the line tangent to the graph of C at the point $(-3,\ 8)$?

(A) $x = -3$ ✔

(B) $x = 2$

(C) $y = 8$

(D) $y = -\frac{27}{10}\,(x + 3) + 8$

(E) $y = 12\,(x + 3) + 8$

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3. A curve is described by the parametric equations $x = t^2 + 2t$ and $y = t^3 + t^2$. An equation of the line tangent to the curve at the point determined by $t = 1$ is

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

(B) $4x - 5y = 2$

(C) $4x - y = 10$

(D) $5x - 4y = 7$ ✔

(E) $5x - y = 13$

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4. If $x=t^2-1$ and $y=2e^t$, then $\frac{dy}{dx} =$

(A) $\frac{e^t}{t}$ ✔

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

(C) $\frac{e^{|t|}}{t^2}$

(D) $\frac{4e^t}{2t-1}$

(E) e^t

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5. A particle moves along the curve $xy=10$. If $x=2$ and $dy/dt=3$, what is the value of dx/dt ?

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(A) −5/2

(B) −6/5 ✓

(C) 0

(D) 4/5

(E) 6/5

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6. Consider the curve in the *xy*-plane represented by $x = e^{t}$ and $y = te^{-t}$ for $t \geq 0$. The slope of the line tangent to the curve at the point where $x=3$ is

(A) 20.086

(B) 0.342

(C) -0.005

(D) -0.011 ✓

(E) -0.033

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7. If $x = e^{2t}$ and $y = \sin(2t)$, then $\frac{dy}{dx} =$

(A) $4e^{2t}\cos(2t)$

(B) $\frac{e^{2t}}{\cos(2t)}$

(C) $\frac{\sin(2t)}{2e^{2t}}$

(D) $\frac{\cos(2t)}{2e^{2t}}$

(E) $\frac{\cos(2t)}{e^{2t}}$ ✔

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8. For what values of t does the curve given by the parametric equations $x = t^3 - t^2 - 1.$ and $y = t^4 + 2t^2 - 8t$ have a vertical tangent?

(A) 0 only

(B) 1 only

(C) 0 and $\frac{2}{3}$ only ✔

(D) 0, $\frac{2}{3}$, and 1

(E) No value

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9. A curve in the plane is defined parametrically by the equations $x = t^3 + \mathrm{t}$ and $y = t^4 + 2t^2$ An equation of the line tangent to the curve at t=1 is

(A) *y=2x*

(B) *y=8x*

(C) *y=2x-1* ✓

(D) *y=4x-5*

(E) *y=8x+13*

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10. If $x = t^2 + 1$ and $y = t^3$, then d^2y/dx^2=

(A) 3/4t ✓

(B) 3/2t

(C) 3*t*

(D) 6*t*

(E) 3/2

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11. The length of a curve from $x = 1$ to $x = 4$ is given by $\int_1^4 \sqrt{1 + 9x^4}\,dx$. If the curve contains the point $(1,\ 6)$, which of the following could be an equation for this curve?

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(A) $y = 3 + 3x^2$

(B) $y = 5 + x^3$ ✓

(C) $y = 6 + x^3$

(D) $y = 6 - x^3$

(E) $y = \frac{16}{5} + x + \frac{9}{5}x^5$

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12. Which of the following integrals gives the length of the graph $y = \sin(\sqrt{x})$ between *x* = *a* and *x* = *b*, where 0 < *a* < *b* ?

(A) $\int_a^b \sqrt{x + \cos^2(\sqrt{x})}dx$

(B) $\int_a^b \sqrt{1 + \cos^2(\sqrt{x})}dx$

(C) $\int_a^b \sqrt{\sin^2(\sqrt{x}) + \frac{1}{4x}\cos^2(\sqrt{x})}dx$

(D) $\int_a^b \sqrt{1 + \frac{1}{4x}\cos^2(\sqrt{x})}dx$ ✓

(E) $\int_a^b \sqrt{\frac{1 + \cos^2(\sqrt{x})}{4x}}dx$

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13. The length of the curve *y*=ln sec *x* from *x*=0 to *x*=*b*, where $0 < b < \frac{\pi}{2}$, may be expressed by which of the following integrals?

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(A) $\int_0^b \sec x dx$ ✔

(B) $\int_0^b \sec^2 x dx$

(C) $\int_0^b (\sec x \tan x)\, dx$

(D) $\int_0^b \sqrt{1+(\ln \sec x)^2} dx$

(E) $\int_0^b \sqrt{1+(\sec^2 x \tan^2 x)} dx$

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14. Which of the following gives the length of the path described by the parametric equations $x = \sin\left(t^3\right)$ and $y = e^{5t}$ fromt=0 tot=π ?

(A) $\int_0^\pi \sqrt{\sin^2\left(t^3\right) + e^{10t}}\ dt$

(B) $\int_0^\pi \sqrt{\cos^2\left(t^3\right) + e^{10t}}\ dt$

(C) $\int_0^\pi \sqrt{9t^4 \cos^2\left(t^3\right) + 25e^{10t}}\ dt$ ✔

(D) $\int_0^\pi \sqrt{3t^2 \cos\left(t^3\right) + 5e^{5t}}\ dt$

(E) $\int_0^\pi \sqrt{\cos^2\left(3t^2\right) + e^{10t}}\ dt$

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15. The length of the curve determined by the equations $x = t^2$ and *y*=*t* from *t*=0 to *t*=4 is

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(A) $\int_0^4 \sqrt{4t+1}dt$

(B) $2\int_0^4 \sqrt{l^2+1}dt$

(C) $\int_0^4 \sqrt{2l^2+1}dt$

(D) $\int_0^4 \sqrt{4t^2+1}dt$ ✔

(E) $2\pi\int_0^4 \sqrt{4l^2+1}dt$

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16. The length of the path described by the parametric equations $x = \cos^3 t$ and $y = \sin^3 t$, for $0 \leq t \leq \frac{\pi}{2}$ is given by

(A) $\int_0^{\frac{\pi}{2}} \sqrt{3\cos^2 t + 3\sin^2 t}dt$

(B) $\int_0^{\frac{\pi}{2}} \sqrt{-3\cos^2 t \sin t + 3\sin^2 t \cos t}dt$

(C) $\int_0^{\frac{\pi}{2}} \sqrt{9\cos^4 t + 9\sin^4 t}dt$

(D) $\int_0^{\frac{\pi}{2}} \sqrt{9\cos^4 t\sin^2 t + 9\sin^4 t\cos^2 t}dt$ ✔

(E) $\int_0^{\frac{\pi}{2}} \sqrt{\cos^6 t + \sin^6 t}dt$

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17. At timet≥0 , a particle moving in the *xy*-plane has velocity vector given by $v(t) = \langle t^2, 5t \rangle$. What is the acceleration vector of the particle at timet=3 ?

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(A) $\left\langle 9,\ \frac{45}{2} \right\rangle$

(B) $\langle 6,\ 5 \rangle$ ✔

(C) $\langle 2,\ 0 \rangle$

(D) $\sqrt{306}$

(E) $\sqrt{61}$

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18. In the *xy*-plane, a particle moves along the parabola $y = x^2 - x$ with a constant speed of $2\sqrt{10}$ units per second. If $\frac{dx}{dt} > 0$, what is the value of $\frac{dy}{dt}$ when the particle is at the point $(2,\ 2)$?

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

(B) $\frac{2\sqrt{10}}{3}$

(C) 3

(D) 6 ✔

(E) $6\sqrt{10}$

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19. A particle moves on the curve *y*=ln *x* so that the *x*-component has velocity $x'(t) = t + 1$ for $t \geq 0$. At time *t*=0, the particle is at the point (1, 0). At time *t*=1, the particle is at the point

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(A) (2,ln2)

(B) (e^2,2)

(C) $\left(\frac{5}{2}, \ln\frac{5}{2}\right)$ ✔

(D) (3, ln3)

(E) $\left(\frac{3}{2}, \ln\frac{3}{2}\right)$

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20. .A particle moves in the *xy*-plane so that at any time *t* its coordinates are $x = t^2 - 1$ and $y = t^4 - 2t^3$ At *t* = 1, its acceleration vector is

(A) (0,-1)

(B) (0,12)

(C) (2, -2)

(D) (2,0) ✔

(E) (2,8)

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21. If a particle moves in the *xy*-plane so that at time *t*>0 its position vector is $\left(\ln\left(t^2 + 2t\right), 2t^2\right)$, then at time *t*=2, its velocity vector is

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(A) $\left(\frac{3}{4}, 8\right)$ ✓

(B) $\left(\frac{3}{4}, 4\right)$

(C) $\left(\frac{1}{8}, 8\right)$

(D) $\left(\frac{1}{8}, 4\right)$

(E) $\left(-\frac{5}{16}, 4\right)$

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22. A particle moves on a plane curve so that at any time $t>0$ its x-coordinate is t^3-t and its y-coordinate is $(2t-1)^3$. The acceleration vector of the particle at $t=1$ is

(A) (0,1)

(B) (2,3)

(C) (2,6)

(D) (6,12)

(E) (6,24) ✓

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23. For any time$t\geq 0$, if the position of a particle in the xy-plane is given by $x=t^2+1$ and $y=\ln(2t+3)$, then the acceleration vector is

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(A) $(2t, 2/(2t+3))$

(B) $(2, -4/(2t+3)^2)$

(C) $(2, 4/(2t+3)^2)$

(D) $(2, 2/(2t+3)^2)$

(E) $(2t, -4/(2t+3)^2)$ ✔