1. The position of a particle in the *xy*-plane is given by $x(t)=4t^2$ and $y(t)=\sqrt{t}$. At $t=4$, the acceleration vector is

(a) $\left\langle 8,-\frac{1}{64}\right\rangle$ (b) $\left\langle 8,-\frac{1}{32}\right\rangle$ (c) $\left\langle 8,\frac{1}{32}\right\rangle$ (d) $\left\langle 32,-\frac{1}{32}\right\rangle$ (e) $\left\langle 32,\frac{1}{4}\right\rangle$

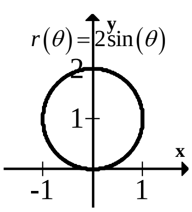
2. The velocity of an object is given by $v(t)=\left\langle 3\sqrt{t},4\right\rangle$. If the object is at the origin when $t=1$, where was it at $t=0$?

(a) $(-3,-4)$ (b) $(-2,-4)$ (c) $(2,4)$ (d) $\left(\frac{3}{2},0\right)$ (e) $\left(-\frac{3}{2},0\right)$

3. A curve in the *xy*-plane is defined by the parametric equations $x(t)=t^3+2$ and $y(t)=t^2-5t$. What is the slope of the line tangent to the curve at the point where $x=10$?

(a) -12 (b) $-\frac{3}{5}$ (c) $-\frac{1}{8}$ (d) $-\frac{1}{12}$ (e) None of these.

4. The area inside the circle with polar equation $r(\theta)=2\sin(\theta)$ and above the lines with equations $y=x$ and $y=-x$ is given by



(a) $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} 2\sin^2(\theta)d\theta$ (b) $\int_{-1}^{1} 2\sin(\theta)d\theta$ (c) $\int_{-1}^{1} 2\sin^2(\theta)-1d\theta$

(d) $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \sin(\theta)d\theta$ (e) $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} 2\sin^2(\theta)d\theta$

5. Find the points on the parametric curve defined by $x(t)=t^3-3t+1$ and $y(t)=t^3-3t^2+1$ where the line tangent to the curve is horizontal

(a) $(1,1),(3,-3)$ (b) $(-3,3)$ only (c) $(-1,1),(3,-3)$ (d) $(0,0),(3,-3)$ (e) None of these

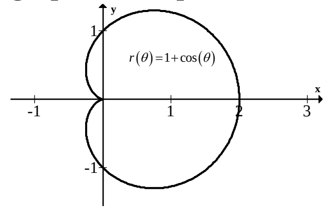
6. Find the length of the parametric curve defined by $x(t)=3t^2$ and $y(t)=2t^3$ for $0\le t\le 1$.

(a) $4\sqrt{2}-2$ (b) $2\sqrt{2}-2$ (c) $4\sqrt{2}$ (d) $4\sqrt{2}-1$ (e) None of these

7. Find the length of the polar curve $r(\theta)=7\cos(\theta)$ for $0\le\theta\le\frac{3\pi}{4}$

(a) $\frac{21}{4}$ (b) $\frac{21\pi}{4}$ (c) $\frac{\pi}{4}$ (d) $\frac{21\pi}{11}$ (e) None of these

8. Which of the following gives the area of the region enclosed by the graph of the polar curve $r(\theta)=1+\cos(\theta)$



(a) $\int_0^{\pi} 1+\cos^2(\theta)\,d\theta$ (b) $\int_0^{\pi} \left[1+\cos(\theta)\right]^2 d\theta$ (c) $\int_0^{2\pi} 1+\cos(\theta)\,d\theta$

(d) $\int_0^{2\pi} \left(1+\cos(\theta)\right)^2 d\theta$ (e) $\frac{1}{2}\int_0^{2\pi} 1+\cos^2(\theta)\,d\theta$

9. Find the points [in polar form (r,θ)] of intersection of the curves $r(\theta)=2$ and $r(\theta)=4\cos(\theta)$

(a) $\left(2,\frac{\pi}{3}\right),\left(2,-\frac{\pi}{3}\right)$ (b) $\left(2,\frac{\pi}{3}\right)$ only (c) $\left(2,\frac{\pi}{4}\right),\left(2,-\frac{\pi}{4}\right)$

(d) $\left(2,\frac{\pi}{6}\right),\left(2,-\frac{\pi}{6}\right)$ (e) $\left(2,\frac{\pi}{6}\right)$ only

10. A particle moves in the *xy*-plane so that at any time t, $t>0$, its coordinates are $x(t)=e^t\sin(t)$ and $y(t)=e^t\cos(t)$. The particle's velocity vector at $t=\pi$ is given by

(a) $\langle e^{\pi},-e^{\pi}\rangle$ (b) $\langle 0.-e^{\pi}\rangle$ (c) $\langle -e^{\pi},e^{\pi}\rangle$ (d) $\langle -e^{\pi},-e^{\pi}\rangle$ (e) $\langle e^{\pi},e^{\pi}\rangle$

11. $\int_1^{\infty} x^{-\frac{5}{4}}dx$ is

(a) $\frac{5}{4}$ (b) $\frac{1}{4}$ (c) 4 (d) -4 (e) Does not exist

12. $\sum_{k=0}^{\infty}\left(-\frac{\pi}{3}\right)^k =$

(a) $\frac{1}{1-\frac{\pi}{3}}$ (b) $\frac{\frac{\pi}{3}}{1-\frac{\pi}{3}}$ (c) $\frac{3}{3+\pi}$ (d) $\frac{\pi}{3+\pi}$ (e) The series does not converge

13. $\lim_{h\to 0}\frac{1}{h}\int_0^h \frac{\sin^2(t)}{t^2}dt =$

(a) 0 (b) $\frac{1}{2}$ (c) 1 (d) 2 (e) Does not exist

14. If the substitution $u=25-x^2$ is made, the integral $\int_0^3 x\sqrt{25-x^2}\,dx$ is

(a) $\frac{1}{2}\int_0^3 \sqrt{u}\,du$ (b) $\frac{1}{2}\int_{25}^{16} \sqrt{u}\,du$ (c) $-\frac{1}{2}\int_0^3 \sqrt{u}\,du$ (d) $\frac{1}{2}\int_{16}^{25} \sqrt{u}\,du$ (e) $2\int_{16}^{25} \sqrt{u}\,du$