

**Multivariable Calculus
Summer Review Packet**

1. Given vectors $\vec{u} = \langle 4, 7, -3 \rangle$ and $\vec{v} = \langle -4, -10, 2 \rangle$, find...

a) $\vec{u} \cdot \vec{v}$

b) $\vec{u} \times \vec{v}$

2. What is the significance of $\vec{u} \cdot \vec{v} = 0$? What about $\vec{u} \times \vec{v} = 0$?

3. If $\vec{r}(t) = (\cos t)\vec{i} + (\sin^2 t)\vec{j}$, find...

a) $\vec{r}'(t)$

b) the arc length of $\vec{r}(t)$ from $t = 0$ to $t = 2\pi$

3 cont. If $\vec{r}(t) = (\cos t)\vec{i} + (\sin^2 t)\vec{j}$, find...

c) $\int \vec{r}(t) dt$

d) $\lim_{t \rightarrow \infty} \vec{r}(t)$

4. How do you parameterize the following? Change this from rectangular to parametric form.

a) $x^2 + y^2 = 3$

b) $2x + 3y = 24$

c) the left side only of $y = x^2 + 4$

d) $4x^2 + 9y^2 = 36$

5. Visualize/describe the following equations in 3D.

a) $x = 4$

b) $x + y = 4$

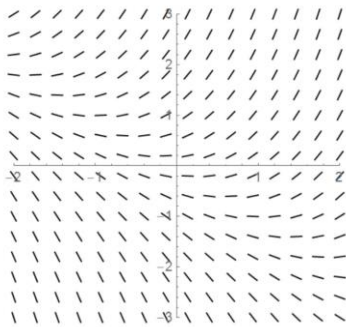
c) $x^2 + y^2 = 4$

d) $z = 4$

e) $x + z = 4$

f) $z = x^2 + 4$

6. Which of the following differential equations could be a match to the slope field below?



a) $\frac{dy}{dx} = x^2 + y$

b) $\frac{dy}{dx} = y^2 + y$

c) $\frac{dy}{dx} = xy$

d) $\frac{dy}{dx} = \frac{y}{x}$

e) none of the above

7. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

a) $y = a \cdot \sin(cx) + \cos^2(dx)$

b) $r(\theta) = e^\theta \cos \theta$

c) $y = \int_a^{x^2} \ln(3t^2) dt$

d) $r(t) = \langle e^{3t}, \tan(3t) \rangle$

8. Find each indefinite integral.

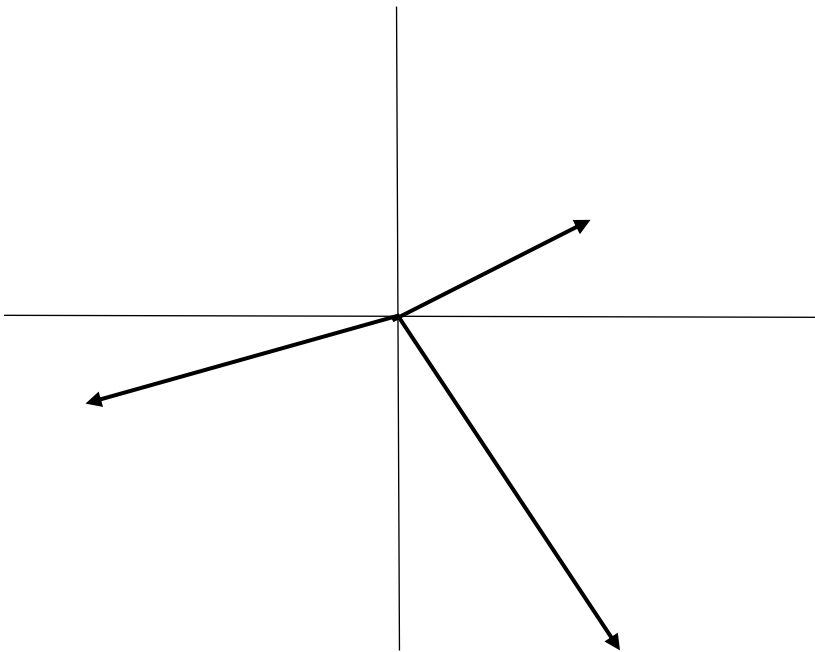
a) $\int x \cdot \ln x \, dx$

b) $\int \frac{2}{x^2 - x - 6} \, dx$

c) $\int (a^2 + 5a + 7) dx$

d) $\int e^{2x-5} dx$

9. Given the vectors below, sketch the resultant.



- 10) Conic sections – circles, ellipses, parabolas and hyperbolas - will be discussed the first few days of class....