Name _____ Test 2, Spring 2019

1) Given the vectors $\vec{v} = \langle -1, 2, 4 \rangle$ and $\vec{w} = \langle 10,15,30 \rangle$ compute $4\vec{v} + \vec{w}$
(6 points)

Do these two lines intersect? Justify your answer.
(6 points)

$$r(t) = \langle t,\ 2t + 2,\ 3 \rangle$$
$$s(t) = \langle 1 + 2t, 2 + 3t,\ 4 - t \rangle$$

2) Find the length of $\vec{v} = \langle -10, 4, 5 \rangle$
(6 points)

3) Find an equation of the line through $(2,3,5)$ and $(1,0,2)$
(8 points)

4) A certain plane is given by the two equations below. Find a vector orthogonal to the entire plane.

$$r(t) = \langle 0,0,0 \rangle + t\langle 1,2,3 \rangle$$
$$s(t) = \langle 0,0,0 \rangle + t\langle 0,2,4 \rangle$$

(6 points)

5) Find the dot product of $\langle -2,4,5\rangle$ and $\langle 3,2,1\rangle$

(6 points)

6) Which of these formulas correctly describe the angle θ between two vectors $\vec{v}$ and $\vec{w}$? Two of these are correct, six of them are not.

(4 points)

A. $\cos^{-1}\left(\frac{\vec{v}\bullet\vec{w}}{|\vec{v}|\cdot|\vec{w}|}\right)$

B. $\sin^{-1}\left(\frac{\vec{v}\bullet\vec{w}}{|\vec{v}|\cdot|\vec{w}|}\right)$

C. $\cos^{-1}\left(\frac{\vec{v}\times\vec{w}}{|\vec{v}|\cdot|\vec{w}|}\right)$

D. $\sin^{-1}\left(\frac{\vec{v}\times\vec{w}}{|\vec{v}|\cdot|\vec{w}|}\right)$

E. $\cos^{-1}\left(\frac{|\vec{v}\bullet\vec{w}|}{|\vec{v}|\cdot|\vec{w}|}\right)$

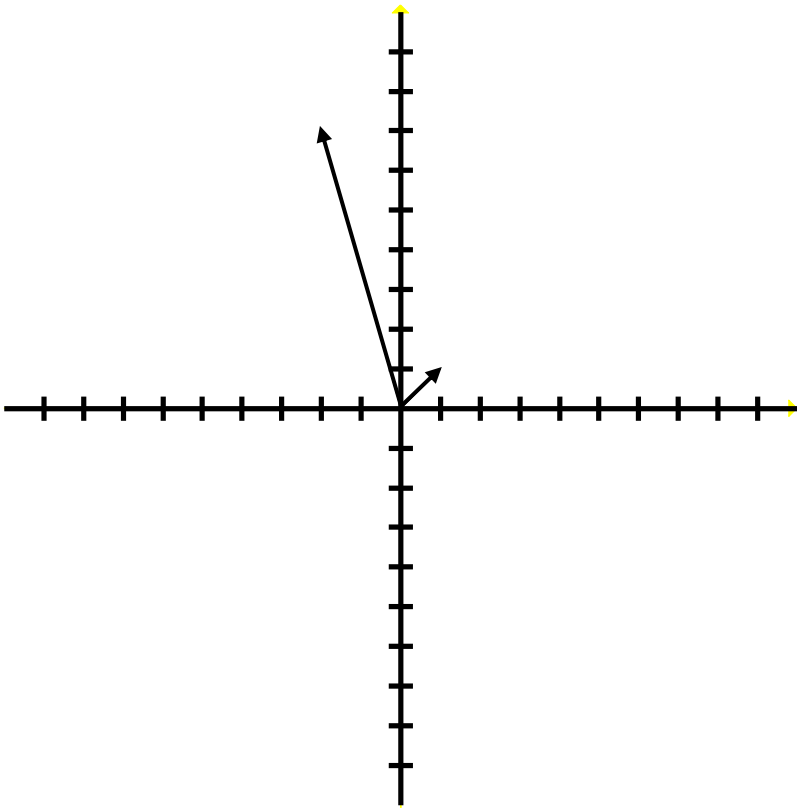
F. $\sin^{-1}\left(\frac{|\vec{v}\bullet\vec{w}|}{|\vec{v}|\cdot|\vec{w}|}\right)$

G. $\cos^{-1}\left(\frac{|\vec{v}\times\vec{w}|}{|\vec{v}|\cdot|\vec{w}|}\right)$

H. $\sin^{-1}\left(\frac{|\vec{v}\times\vec{w}|}{|\vec{v}|\cdot|\vec{w}|}\right)$

7) Illustrate the projection of $\langle -2,7 \rangle$ onto $\langle 1,1 \rangle$

(6 points)



8) Find the limit below.

(6 points)

$$\lim_{t \to 0} \langle \frac{\sin(t)}{t}, \frac{t^2 + t}{t}, \ 4t + 2 \rangle$$

9) Find the derivative below.
(8 points)

$$\frac{d}{dt}\left\langle \frac{\sin(t)}{t}, \frac{t^2+t}{t}, 4t+2 \right\rangle$$

10) Find the integral below.
(8 points)

$$\int \left\langle \frac{1}{1+2t}, \frac{t^2+t}{t}, 4t+2 \right\rangle dt$$

11) Find the integral below.

(8 points)

$$\int x \cosh(x)\, dx$$

12) Find the integral below.

(8 points)

$$\int \frac{e^x}{1+e^{2x}}dx$$

13) Determine whether the series below converges or diverges. Circle which test(s) you use. (6 points)

[Divergence Test] [Integral Test] [Comparison Test] [Limit Comparison Test] [Ratio Test] [Root Test] [Geometric Series] [p-Series] [Alternating Series]

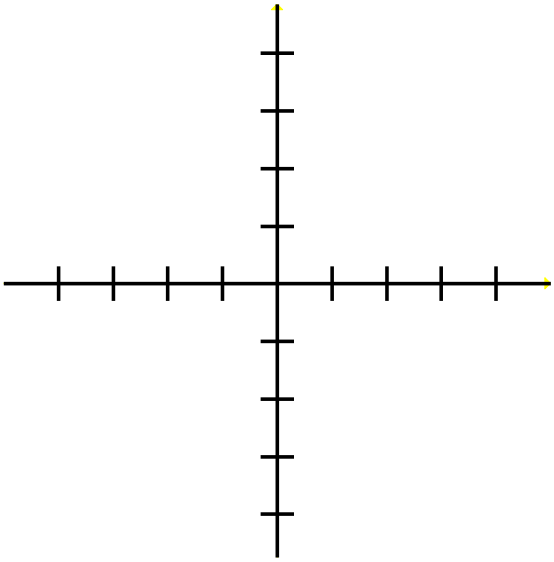
$$\sum_{k=1}^{\infty} \frac{k^2+1}{2k-3}$$

14) Determine whether the series below converges or diverges. Circle which test(s) you use. (8 points)

[Divergence Test] [Integral Test] [Comparison Test] [Limit Comparison Test] [Ratio Test] [Root Test] [Geometric Series] [p-Series] [Alternating Series]

$$\sum_{k=1}^{\infty} \frac{2k-3}{k^2+1}$$

15) **(2 point bonus)** Graph the curve $r = 2\sin(3\theta)$, then set up the integral to find the area enclosed.



16) **(2 point bonus)** Graph the curve $r = 3\cos(5\theta)$, then set up the integral to find the perimeter of the figure created.