Student: Phong Vo **Date:** 02/12/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 12.5 Homework

1. How do you find an equation for a line through the points $P_0(x_0, y_0, z_0)$ and $P_1(x_1, y_1, z_1)$?

Choose the correct answer below.

- **A.** Use the general form of an equation of a line in $\mathbf{R}^3$ space, $\mathbf{r} = \mathbf{r}_0 + t\mathbf{v}$, where $\mathbf{r}_0 = \langle x_1, y_1, z_1 \rangle$ and $\mathbf{v} = \langle x_0, y_0, z_0 \rangle$.
- **B.** Use the general form of an equation of a line in $\mathbf{R}^3$ space, $\mathbf{r} = \mathbf{r}_0 + t\mathbf{v}$, where $\mathbf{r}_0 = \langle x_0, y_0, z_0 \rangle$ and $\mathbf{v} = \langle x_1, y_1, z_1 \rangle$.
- **C.** Use the general form of an equation of a line in $\mathbf{R}^3$ space, $\mathbf{r} = \mathbf{r}_0 + t\mathbf{v}$, where $\mathbf{r}_0 = \langle x_1 - x_0, y_1 - y_0, z_1 - z_0 \rangle$ and $\mathbf{v} = \langle x_0, y_0, z_0 \rangle$.
- ✔ **D.** Use the general form of an equation of a line in $\mathbf{R}^3$ space, $\mathbf{r} = \mathbf{r}_0 + t\mathbf{v}$, where $\mathbf{r}_0 = \langle x_0, y_0, z_0 \rangle$ and $\mathbf{v} = \langle x_1 - x_0, y_1 - y_0, z_1 - z_0 \rangle$.

2. In what plane does the curve $\mathbf{r}(t) = 4t\mathbf{i} + 4t^4\mathbf{k}$ lie?

Choose the correct answer below.

- **A.** The curve lies in the xy-plane.
- **B.** The curve lies in the yz-plane.
- ✔ **C.** The curve lies in the xz-plane.

3. How do you determine whether $\mathbf{r}(t) = f(t)\mathbf{i} + g(t)\mathbf{j} + h(t)\mathbf{k}$ is continuous at $t = a$?

Choose the correct answer below.

- **A.** Find $\lim_{t \to \infty} \mathbf{r}(t)$, if $\lim_{t \to \infty} \mathbf{r}(t) = \mathbf{r}(a)$, $\mathbf{r}(t)$ is continuous.
- **B.** Find $\lim_{t \to \infty} \mathbf{r}(t)$, if $\lim_{t \to \infty} \mathbf{r}(t)$ does not exist, $\mathbf{r}(t)$ is continuous.
- **C.** Find $\lim_{t \to a} \mathbf{r}(t)$, if $\lim_{t \to a} \mathbf{r}(t)$ does not exist, $\mathbf{r}(t)$ is continuous.
- ✔ **D.** Find $\lim_{t \to a} \mathbf{r}(t)$, if $\lim_{t \to a} \mathbf{r}(t) = \mathbf{r}(a)$, $\mathbf{r}(t)$ is continuous.

4. Find a vector equation of the line through (0,0,0) that is perpendicular to both $\mathbf{u} = \langle -1, -1, 0 \rangle$ and $\mathbf{w} = \langle 0, 1, 1 \rangle$ where $t = 0$ corresponds to the first given point.

$\langle x, y, z \rangle = \langle 0, 0, 0 \rangle + t\langle -1, 1, -1 \rangle$

(Simplify your answers. Type integers or fractions.)

5. Find an equation of the line segment joining the given pairs of points.

(0,0,0) and (9,10,7)

Choose the correct answer below.

- **A.** $\langle x,y,z\rangle = t\langle 9,10,7\rangle$, for $0 \le t \le 1$
- **B.** $\langle x,y,z\rangle = t\langle -9,10,-7\rangle$, for $-1 < t < 1$
- **C.** $\langle x,y,z\rangle = t$, for $0 < t < 1$
- **D.** $\langle x,y,z\rangle = t\langle 7,9,10\rangle$, for $-\infty < t < \infty$

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6. Evaluate the following limit.

$$\lim_{t\to\infty}\left(2e^{-t}\mathbf{i} - \frac{2t}{t+5}\mathbf{j} + 3\tan^{-1}t\,\mathbf{k}\right)$$

$$\lim_{t\to\infty}\left(2e^{-t}\mathbf{i} - \frac{2t}{t+5}\mathbf{j} + 3\tan^{-1}t\,\mathbf{k}\right) = -2j + \frac{3\pi}{2}k$$

(Type an exact answer, using π as needed.)

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7. Evaluate the following limit.

$$\lim_{t\to 0}\left(\frac{2\sin 3t}{3t}\mathbf{i} - \frac{e^{2t}-2t-1}{t}\mathbf{j} + \frac{3\cos t + \frac{3t^2}{2} - 3}{5t^2}\mathbf{k}\right)$$

$$\lim_{t\to 0}\left(\frac{2\sin 3t}{3t}\mathbf{i} - \frac{e^{2t}-2t-1}{t}\mathbf{j} + \frac{3\cos t + \frac{3t^2}{2} - 3}{5t^2}\mathbf{k}\right) = (2)\mathbf{i} + (0)\mathbf{j} + (0)\mathbf{k}$$

(Simplify your answers. Type exact answers.)

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8. A pair of lines in $\mathbb{R}^3$ are said to be skew if they are neither parallel nor intersecting. Determine whether the following pair of lines is parallel, intersecting, or skew. If the lines intersect, determine the point(s) of intersection.

$\mathbf{r}(t) = \langle 2+5t, 1-8t, 4+3t\rangle$
$\mathbf{R}(s) = \langle 18+4s, 5+s, 16+3s\rangle$

Select the correct choice below and, if necessary, fill in any answer boxes to complete your choice.

- **A.** The lines intersect at the single point $(2, 1, 4)$. (Simplify your answers.)
- **B.** The lines are skew.
- **C.** The lines are parallel.
- **D.** The lines intersect at all points on the line $\mathbf{r}(t)$.

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9. Find the domain of the following vector-valued function.

$$\mathbf{r}(t) = \sqrt{1 - t^2}\,\mathbf{i} + \sqrt{t}\,\mathbf{j} + \frac{10}{\sqrt{5+t}}\mathbf{k}$$

Select the correct choice below and fill in any answer boxes within your choice.

A. $\{t: t \le \_\_\_ \text{ or } t > \_\_\_\}$

B. $\{t: t < \_\_\_ \text{ or } t \ge \_\_\_\}$

C. $\{t: \_\_\_ \le t < \_\_\_\}$

D. $\{t: t < \_\_\_ \text{ or } t > \_\_\_\}$

E. $\{t: \_\_\_ < t < \_\_\_\}$

F. $\{t: t \le \_\_\_ \text{ or } t \ge \_\_\_\}$

G. $\{t: \_\_\_ < t \le \_\_\_\}$

H. $\{t: 0 \le t \le 1\}$

10. Find the point (if it exists) at which the following plane and line intersect.

$x = 9$; $\mathbf{r}(t) = \langle t,t,t \rangle$, for $-\infty < t < \infty$

Select the correct choice below and fill in any answer boxes within your choice.

A. The point at which the plane and line intersect is (9,9,9) .
(Simplify your answer. Type an ordered triple.)

B. The plane and line do not intersect.