WORKSHEET: VECTOR FUNCTIONS

1. Define $f(x) = a^T x$ for $x = (x_1, x_2)$ and $a = (2, 4)$.

   (a) Find $f(5, -3)$

   (b) For $u = (5, -3)$, $v = (4, 1)$, $\alpha = 10$, and $\beta = 2$, find:

   i. αu

   ii. βv

   iii. $\alpha u + \beta v$

   iv. $f(\alpha u + \beta v)$

   v. $\alpha f(u)$

   vi. $\beta f(v)$

   vii. $\alpha f(u) + \beta f(v)$

2. Define $f(x) = x_1^2 + x_2^2$ for $x = (x_1, x_2)$.

   (a) Find $f(5, -3)$

   (b) For $u = (5, -3)$, $v = (4, 1)$, $\alpha = 10$, and $\beta = 2$, find:

   i. αu

   ii. βv

   iii. $\alpha u + \beta v$

   iv. $f(\alpha u + \beta v)$

   v. $\alpha f(u)$

   vi. $\beta f(v)$

   vii. $\alpha f(u) + \beta f(v)$

3. Define $f(x) = 4x_1 - x_2 + 2$ for $x = (x_1, x_2)$.

(a) Find $f(5, -3)$

(b) For $u = (5, -3)$, $v = (4, 1)$, $\alpha = 10$, and $\beta = 2$, find:

i. αu

ii. βv

iii. $\alpha u + \beta v$

iv. $f(\alpha u + \beta v)$

v. $\alpha f(u)$

vi. $\beta f(v)$

vii. $\alpha f(u) + \beta f(v)$

(c) For $u = (5, -3)$, $v = (4, 1)$,

$\alpha = 0.9$, and $\beta = 0.1$, find:

i. αu

ii. βv

iii. $\alpha u + \beta v$

iv. $f(\alpha u + \beta v)$

v. $\alpha f(u)$

vi. $\beta f(v)$

vii. $\alpha f(u) + \beta f(v)$

4. Define $f(x) = 7x_1 - x_2$ for $x = (x_1, x_2)$.

   (a) Find $f(5, -3)$

   (b) For $u = (5, -3)$, $v = (4, 1)$, $\alpha = 10$, and $\beta = 2$, find:

      i. αu

      ii. βv

      iii. $\alpha u + \beta v$

      iv. $f(\alpha u + \beta v)$

      v. $\alpha f(u)$

      vi. $\beta f(v)$

      vii. $\alpha f(u) + \beta f(v)$