Mecánica y Termodinámica
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Práctica N° 0: Repaso matemático

Resultados

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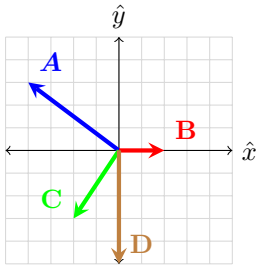
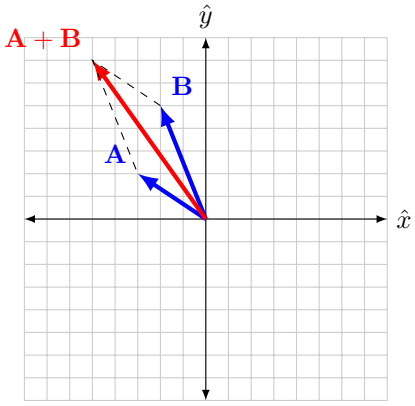
1. $|\boldsymbol{A}| = 5, \theta \simeq 2.5 \simeq 143°$,
$|\mathbf{B}| = 2, \theta = 0$,
$|\mathbf{C}| = \sqrt{13} \simeq 3.6, \theta \simeq 4.12(-2.16) \simeq 236°(-124°)$,
$|\mathbf{D}| = 5, \theta = \frac{3\pi}{2}(-\frac{\pi}{2}) = 270°(-90°)$

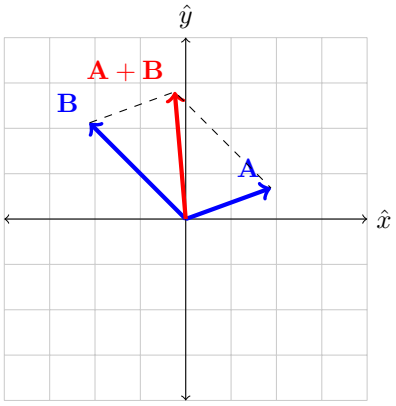


2. (a) $\mathbf{A} = (\sqrt{3}; 1) = \sqrt{3}\hat{x} + \hat{y}$
(b) $\mathbf{A} = (-1.5; \frac{3}{2}\sqrt{3}) = -1.5\hat{x} + \frac{3}{2}\sqrt{3}\hat{y}$
(c) $\mathbf{A} = (0; -1.5) = -1.5\hat{y}$

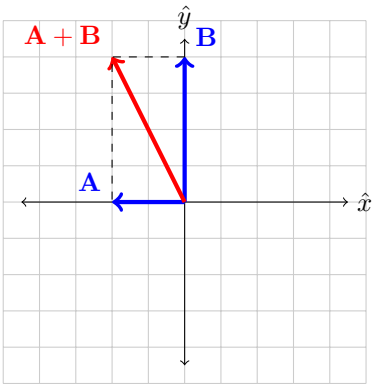
3.



(a)



(b)



(c)

4. (a) $\mathbf{C} = \mathbf{A} + \mathbf{B} = (-5; 7)$, $|\mathbf{C}| = \sqrt{74} \simeq 8.6, \theta \simeq 2.2 \simeq 126°$,
$\mathbf{D} = \mathbf{A} - \mathbf{B} = (-1; -3)$, $|\mathbf{D}| = \sqrt{10} \simeq 3.16$, $\theta = 4.4 \simeq 252°$
(b) $\mathbf{C} = \mathbf{A} + \mathbf{B} \simeq (-0.24; 2.80)$, $|\mathbf{C}| \simeq 2.82$, $\theta \simeq 1.66 \simeq 95°$
$\mathbf{D} = \mathbf{A} - \mathbf{B} \simeq (4; 1.43)$, $|\mathbf{D}| \simeq 4.25$, $\theta \simeq 5.94(-0.34) \simeq 340°(-20°)$
(c) $\mathbf{C} = \mathbf{A} + \mathbf{B} = (-2; 4)$, $|\mathbf{C}| \simeq 4.47$, $\theta \simeq 2.03 \simeq 116°$
$\mathbf{D} = \mathbf{A} - \mathbf{B} = (-2; -4)$, $|\mathbf{D}| \simeq 4.47$, $\theta \simeq 4.25(-2.03) \simeq 244°(-116°)$

5. (a) $(-7; -1)$, (b) $(-6; 2; -6)$

6. (a) $(-0.186; 0.928; 0.186)$, (b) $(15; 14; 25)$, (c) $(-2; -6.6; 3)$

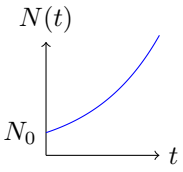
7. $\hat{x} \cdot \hat{x} = 1, \hat{x} \cdot \hat{y} = 0, \hat{x} \cdot \hat{z} = 0, \hat{y} \cdot \hat{y} = 1, \hat{y} \cdot \hat{z} = 0, \hat{z} \cdot \hat{z} = 1.$

8. –

9. (a) $\mathbf{A}\cdot\mathbf{B} = 0$, es perpendicular. (b) $\mathbf{A}\cdot\mathbf{B} = -5$, no es perpendicular. (c) $\mathbf{A}\cdot\mathbf{B} = 3$, no es perpendicular.

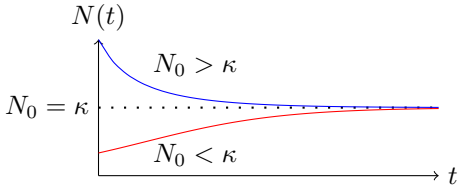
10. (a) $y(t) = 2t$
    (b) $y(t) = at + y_0$
    (c) $y(t) = 2t + (e^t - 1) + y_0$
    (d) $y(t) = -\frac{1}{3}\cos(3t) + \frac{1}{3} + y_0$
    (e) $y(t) = y_0 e^{2(t-1)}$
    (f) $y(t) = \ln(t) + y_0$

11. (a) $N(t) = N_0 e^{\kappa t}$

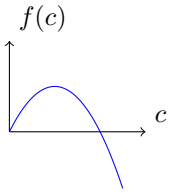


    (b) $\ln(2)/\kappa$

12. (a) Crece para $N < \kappa$, disminuye para $N > \kappa$.
    (b) $N = \kappa$
    (c) $N = \kappa$
    (d) $N(t) = \dfrac{\kappa}{1 + (\kappa/N_0 - 1)e^{-rt}}$
    (e)



13. (a)



    (b) $f(c) > 0$ si $0 < c < 2$, $f(c) < 0$ si $c > 2$ ($c > 0$).
    (c) Subirá.
    (d) $c(t) = \dfrac{2}{1 + \frac{5}{3}e^{-2t}}$.

14. $v(t) = v_0 e^{-\gamma t}$

15. (a) $x(t) = x_0 + v_0 t + \dfrac{1}{2}\dfrac{F}{m}t^2$
    (b) $x(t) = \frac{A}{6}t^3 + v_0 t + x_0$
    (c) $x(t) = e^t + (v_0 - 1)t + x_0 - 1$

16. $x(t) = \cos(3t) \rightarrow x'(t) = -3\sin(3t) \rightarrow x''(t) = -9\cos(3t) = -9x(t)$

17. (a) $x(t) = 3\cos(2t)$
    (b) $x(t) = 3\sin(2t)$
    (c) $x(t) = 3\cos(2t) - 3$