1. Take $V = \langle -2, 6 \rangle$. Calculate $-3V$ and $\frac{1}{2}V$.

$-3V = \langle (-3)\cdot(-2), -3\cdot 6 \rangle$
$= \langle 6, -18 \rangle$.
$\frac{1}{2}V = \langle \frac{1}{2}\cdot(-2), \frac{1}{2}\cdot 6 \rangle$
$= \langle -1, 3 \rangle$.

Visual

2. Take $V = \langle -2, 6 \rangle$. Calculate the length of V, $-3V$ and $\frac{1}{2}V$.

$\|V\| = \sqrt{(-2)^2 + (6)^2}$
$= \sqrt{4 + 36}$
$= \sqrt{40}$ or $2\sqrt{10}$

$\|-3V\| = |-3| \cdot \|V\|$
$= 3 \cdot \sqrt{40}$ or $6\sqrt{10}$

$\|\frac{1}{2}V\| = |\frac{1}{2}| \cdot \|V\|$
$= \frac{1}{2}\sqrt{40}$ or $\sqrt{10}$

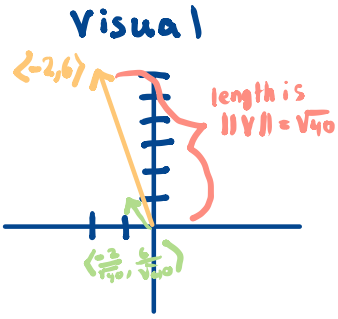
3. Take $V = \langle -2, 6 \rangle$. Write its polar form.

$\|V\| = \sqrt{40}$ or $2\sqrt{10}$

$\hat{V} = \frac{1}{\|V\|} V$
$= \left\langle \frac{-2}{\sqrt{40}}, \frac{6}{\sqrt{40}} \right\rangle$ or $\left\langle \frac{-1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right\rangle$

Polar form $\sqrt{40}\left\langle \frac{-2}{\sqrt{40}}, \frac{6}{\sqrt{40}} \right\rangle$ or $2\sqrt{10}\left\langle \frac{-1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right\rangle$

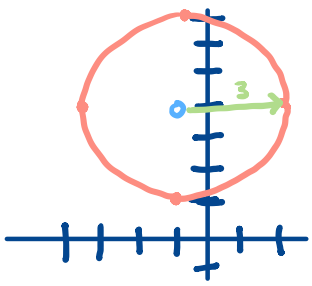
Visual



4. Find the equation of the circle of radius 3 centered at $(-1, 4)$.

distance from $(-1,4)$ is 3
$\|(x, y) - (-1, 4)\| = 3$
$\|(x-(-1), y-4)\| = 3$
$\|(x+1, y-4)\| = 3$
$\sqrt{(x+1)^2 + (y-4)^2} = 3$
$(x+1)^2 + (y-4)^2 = 3^2$
$(x+1)^2 + (y-4)^2 = 9$
final answer

Visual



5. Find the projection of $(-1, 4)$ onto the unit circle.

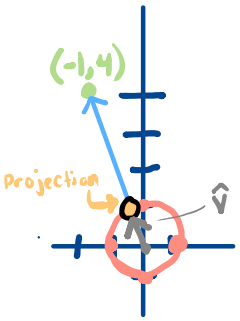
$V = (-1,4) - (0,0) = \langle -1, 4 \rangle$

$\|V\| = \sqrt{(-1)^2 + (4)^2} = \sqrt{1 + 16} = \sqrt{17}$

$\hat{V} = \frac{1}{\|V\|} V = \frac{1}{\sqrt{17}} \langle -1, 4 \rangle = \left\langle -\frac{1}{\sqrt{17}}, \frac{4}{\sqrt{17}} \right\rangle \Rightarrow$

$\hat{V} + (0,0) = \left(-\frac{1}{\sqrt{17}}, \frac{4}{\sqrt{17}}\right)$ final answer

Visual



6. Write $g(x) = -2(x-1)^2 + 1$ as a composite function using pow_2. Use a graphing tool to verify your answer.

$T_{-1}(x) = x - 1$

$T_1(x) = x + 1$

$S_{-2}(x) = -2x$

$\text{Pow}_2(x) = x^2$

$g(x) = -2(x-1)^2 + 1$

$= -2\left(T_{-1}(x)\right)^2 + 1$

$= -2\,\text{Pow}_2(T_{-1}(x)) + 1$

$= S_{-2}(\text{Pow}_2(T_{-1}(x))) + 1$

$= T_1(S_{-2}(\text{Pow}_2(T_{-1}(x))))$

$\Rightarrow g = T_1 \circ S_{-2} \circ \text{Pow}_2 \circ T_{-1}$

7. Write $g(x) = 3(5x+1)^3$ as a composite function using pow_3. Use a graphing tool to verify your answer.

$T_1(x) = x + 1$

$S_5(x) = 5x$

$S_3(x) = 3x$

$\text{Pow}_3(x) = x^3$

$g(x) = 3(5x+1)^3$

$= 3(S_5(x) + 1)^3$

$= 3(T_1(S_5(x)))^3$

$= 3\,\text{Pow}_3(T_1(S_5(x)))$

$= S_3(\text{Pow}_3(T_1(S_5(x))))$

$\Rightarrow g = S_3 \circ \text{Pow}_3 \circ T_1 \circ S_5$