WeatherPy

Note

- Instructions have been included for each segment. You do not have to follow them exactly, but they are included to help you think through the steps.

In [1]:
```
# Dependencies and Setup
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import requests
import time
from datetime import datetime
from scipy.stats import linregress

# Import API key
from api_keys import weather_api_key

# Incorporated citipy to determine city based on latitude and longitude
from citipy import citipy

# Output File (CSV)
output_data_file = "../output_data/cities.csv"

# Range of latitudes and longitudes
lat_range = (-90, 90)
lng_range = (-180, 180)
```

Generate Cities List

In [25]:
```
# List for holding lat_lngs and cities
lat_lngs = []
cities = []

# Create a set of random lat and lng combinations
lats = np.random.uniform(lat_range[0], lat_range[1], size=1500)
lngs = np.random.uniform(lng_range[0], lng_range[1], size=1500)
lat_lngs = zip(lats, lngs)

# Identify nearest city for each lat, lng combination
for lat_lng in lat_lngs:
    city = citipy.nearest_city(lat_lng[0], lat_lng[1]).city_name

    # If the city is unique, then add it to a our cities list
    if city not in cities:
        cities.append(city)

# Print the city count to confirm sufficient count
print(f"The total number of cities is {len(cities)}")
```

```
The total number of cities is 625
```

Perform API Calls

- Perform a weather check on each city using a series of successive API calls.
- Include a print log of each city as it'sbeing processed (with the city number and city name).

In [3]:
```
# Set variables
c_data_list = []
set_no = 1
rec_no = 1
num_of_set = 50
units = "imperial"

print("Beginning Data Retrieval")
print("-----------------------------")

# Put city data into the list
for city in cities:
    url = f"http://api.openweathermap.org/data/2.5/weather?q={city}&appid={weather_api_key}&units={units}"
    response = requests.get(url).json()
    try:
        c_data_list.append({"City" : city,
                            "Lat" : response["coord"]["lat"],
                            "Lng" : response["coord"]["lon"],
                            "Max Temp" : response["main"]["temp_max"],
                            "Humidity" : response["main"]["humidity"],
                            "Cloudiness" : response["clouds"]["all"],
                            "Wind Speed" : response["wind"]["speed"],
                            "Country" : response["sys"]["country"],
                            "Date" : response["dt"]})
        print(f"Processing Record {rec_no} of Set {set_no} | {city}")
        if (len(c_data_list)) % num_of_set == 0:
            rec_no = 1
            set_no += 1

        else:
            rec_no += 1

    except KeyError:
        print("City not found. Skipping...")

print("-----------------------------")
print("Data Retrieval Complete")
print("-----------------------------")
```

```
Beginning Data Retrieval
-----------------------------
Processing Record 1 of Set 1 | hermanus
City not found. Skipping...
Processing Record 2 of Set 1 | yar-sale
Processing Record 3 of Set 1 | evansville
Processing Record 4 of Set 1 | fort saint james
Processing Record 5 of Set 1 | ushuaia
Processing Record 6 of Set 1 | ust-kan
Processing Record 7 of Set 1 | port alfred
Processing Record 8 of Set 1 | auki
Processing Record 9 of Set 1 | mataura
Processing Record 10 of Set 1 | hilo
Processing Record 11 of Set 1 | georgetown
```

.
.
.

```
Processing Record 25 of Set 12 | bijie
Processing Record 26 of Set 12 | aguimes
Processing Record 27 of Set 12 | ushtobe
Processing Record 28 of Set 12 | mumford
Processing Record 29 of Set 12 | paamiut
Processing Record 30 of Set 12 | banamba
Processing Record 31 of Set 12 | henties bay
-----------------------------
Data Retrieval Complete
-----------------------------
```

Convert Raw Data to DataFrame

- Export the city data into a .csv.
- Display the DataFrame

In [4]:
```
# Create a dataframe to store the city data
cities_df = pd.DataFrame(c_data_list)
cities_df.count()
```

Out[4]:
```
City          581
Lat           581
Lng           581
Max Temp      581
Humidity      581
Cloudiness    581
Wind Speed    581
Country       581
Date          581
dtype: int64
```

In [5]:
```
# Show five cities
cities_df.head()
```

Out[5]:

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
0	hermanus	-34.42	19.23	53.01	90	17	1.99	ZA	1595126828
1	yar-sale	66.83	70.83	49.01	91	100	12.64	RU	1595126588
2	evansville	37.97	-87.56	84.20	70	1	6.93	US	1595126613
3	fort saint james	54.43	-124.25	60.55	81	74	4.72	CA	1595127017
4	ushuaia	-54.80	-68.30	32.00	94	75	9.17	AR	1595126619

Inspect the data and remove the cities where the humidity > 100%.

Skip this step if there are no cities that have humidity > 100%.

In [6]:
```
# Describe the city data
cities_df.describe()
```

Out[6]:

	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Date
count	581.000000	581.000000	581.000000	581.000000	581.000000	581.000000	5.810000e+02
mean	19.581756	15.249948	69.617590	70.695353	45.500861	7.475800	1.595127e+09
std	33.084487	90.732088	13.312144	19.158462	38.521719	5.111438	1.432299e+02
min	-54.800000	-179.170000	24.800000	8.000000	0.000000	0.160000	1.595126e+09
25%	-7.710000	-69.260000	59.900000	60.000000	1.000000	3.740000	1.595127e+09
50%	21.200000	23.040000	71.080000	74.000000	40.000000	5.990000	1.595127e+09
75%	47.850000	97.520000	80.560000	85.000000	82.000000	10.250000	1.595127e+09
max	78.220000	179.320000	107.600000	100.000000	100.000000	33.910000	1.595127e+09

In [7]:
```
#  Get the indices of cities that have humidity over 100%.
humidity_idx = cities_df.loc[(cities_df.iloc[:, 4] > 100)].index
humidity_idx
```

Out[7]:
```
Int64Index([], dtype='int64')
```

In [8]:
```
# Make a new DataFrame equal to the city data to drop all humidity outliers by index.
# Passing "inplace=False" will make a copy of the city_data DataFrame, which we call "clean_city_data".
filtered_df = cities_df.drop(index = humidity_idx)
filtered_df.head()
```

Out[8]:

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
0	hermanus	-34.42	19.23	53.01	90	17	1.99	ZA	1595126828
1	yar-sale	66.83	70.83	49.01	91	100	12.64	RU	1595126588
2	evansville	37.97	-87.56	84.20	70	1	6.93	US	1595126613
3	fort saint james	54.43	-124.25	60.55	81	74	4.72	CA	1595127017
4	ushuaia	-54.80	-68.30	32.00	94	75	9.17	AR	1595126619

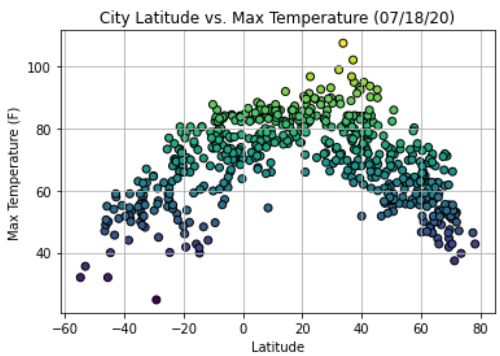
In [9]:
```
# Extract relevant fields from the data frame
to_csv_df = cities_df.iloc[:, [0, 5, 7, 8, 4, 1, 2, 3, 6]]
to_csv_df.index.name = "City_ID"
# Export the City_Data into a csv

to_csv_df.to_csv(output_data_file)
```

Plotting the Data

- Use proper labeling of the plots using plot titles (including date of analysis) and axes labels.
- Save the plotted figures as .pngs.

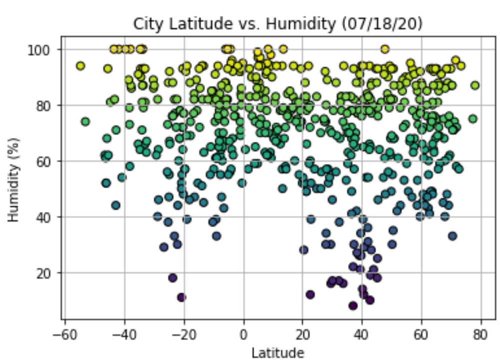
Latitude vs. Temperature Plot

In [10]:
```
# Get data to make a scatter plot from the city data
latitude = cities_df.iloc[:, 1]
max_temp = cities_df.iloc[:, 3]

# Create a scatter plot - Latitude vs. Max Temperature
plt.scatter(latitude, max_temp, c = max_temp, cmap = "viridis", edgecolors = "black")
plt.grid()
plt.xlabel("Latitude")
plt.ylabel("Max Temperature (F)")
plt.title(f"City Latitude vs. Max Temperature ({datetime.today().strftime('%m/%d/%y')})")
plt.savefig("../output_data/max_temp.png")
plt.show()
```



Latitude vs. Humidity Plot

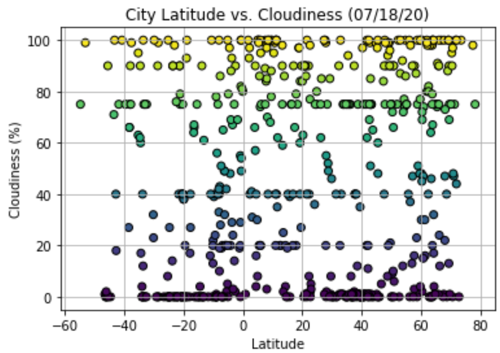
In [11]:
```
# Get humidity data from the city data
humidity = cities_df.iloc[:, 4]

# Create a scatter plot - Latitude vs. Humidity
plt.scatter(latitude, humidity, c = humidity, cmap = "viridis", edgecolors = "black")
plt.grid()
plt.xlabel("Latitude")
plt.ylabel("Humidity (%)")
plt.title(f"City Latitude vs. Humidity ({datetime.today().strftime('%m/%d/%y')})")
plt.savefig("../output_data/humidity.png")
plt.show()
```



Latitude vs. Cloudiness Plot

In [12]:

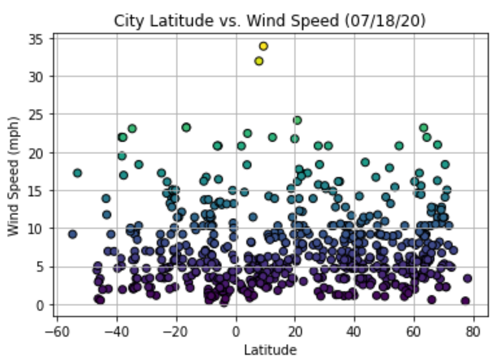
```
# Get cloudiness from the city data
cloudiness = cities_df.iloc[:, 5]

# Create a scatter plot - Latitude vs. Cloudiness
plt.scatter(latitude, cloudiness, c = cloudiness, cmap = "viridis", edgecolors = "black")
plt.grid()
plt.xlabel("Latitude")
plt.ylabel("Cloudiness (%)")
plt.title(f"City Latitude vs. Cloudiness ({datetime.today().strftime('%m/%d/%y')})")
plt.savefig("../output_data/cloudiness.png")
plt.show()
```



Latitude vs. Wind Speed Plot

In [13]:

```
# Get wind speed from the city data
wind_speed = cities_df.iloc[:, 6]

# Create a scatter plot - Latitude vs. Cloudiness
plt.scatter(latitude, wind_speed, c = wind_speed, cmap = "viridis", edgecolors = "black")
plt.grid()
plt.xlabel("Latitude")
plt.ylabel("Wind Speed (mph)")
plt.title(f"City Latitude vs. Wind Speed ({datetime.today().strftime('%m/%d/%y')})")
plt.savefig("../output_data/wind_speed.png")
plt.show()
```



Linear Regression

In [14]:

```
# OPTIONAL: Create a function to create Linear Regression plots
def linear_r_plot(x_values, y_values):
    (slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
    print(f"The r-squared is: {rvalue**2}")
    regress_values = x_values * slope + intercept
    line_eq = f"y = {round(slope, 2)}x + {round(intercept, 2)}"

    plt.plot(x_values, regress_values, "r-")

    return line_eq
```

In [15]:

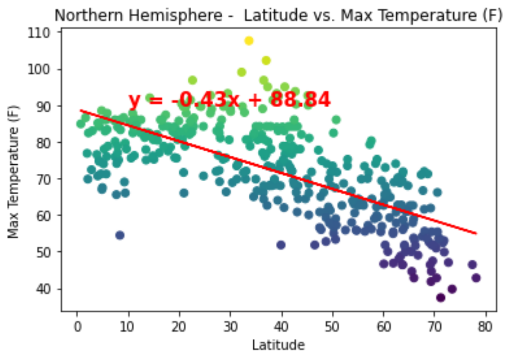
```
# Create Northern and Southern Hemisphere DataFrames
north_df = cities_df.loc[cities_df.iloc[:, 1] >= 0]
south_df = cities_df.loc[cities_df.iloc[:, 1] < 0]
```

Northern Hemisphere - Max Temp vs. Latitude Linear Regression

In [16]:

```
# Get latitude and max temperature data on Northern Hemisphere
north_lat = north_df.iloc[:, 1]
north_max_temp = north_df.iloc[:, 3]

# Create a scatter plot with a linear regression - Latitude vs. Max temperature
plt.scatter(north_lat, north_max_temp, c = north_max_temp, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Max Temperature (F)")
plt.title("Northern Hemisphere -  Latitude vs. Max Temperature (F)")
plt.annotate(linear_r_plot(north_lat, north_max_temp), (10, 90), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/northern_max_temp.png")
plt.show()
```

```
The r-squared is: 0.47007889389017865
```

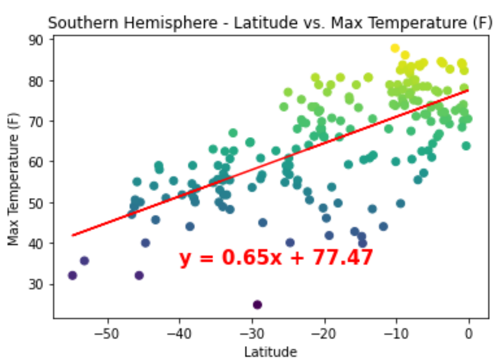


Southern Hemisphere - Max Temp vs. Latitude Linear Regression

In [17]:

```
# Get latitude and max temperature data on Southern Hemisphere
south_lat = south_df.iloc[:, 1]
south_max_temp = south_df.iloc[:, 3]

# Create a scatter plot with a linear regression - Latitude vs. Max temperature
plt.scatter(south_lat, south_max_temp, c = south_max_temp, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Max Temperature (F)")
plt.title("Southern Hemisphere - Latitude vs. Max Temperature (F)")
plt.annotate(linear_r_plot(south_lat, south_max_temp), (-40, 35), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/southern_max_temp.png")
plt.show()
```

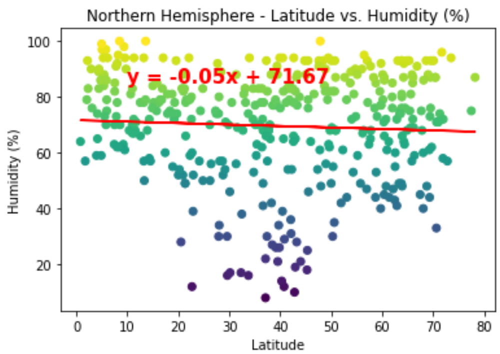
```
The r-squared is: 0.46943417348125094
```



Northern Hemisphere - Humidity (%) vs. Latitude Linear Regression

In [18]:
```
# Get humidity data on Northern Hemisphere
north_humidity = north_df.iloc[:, 4]

# Create a scatter plot with a linear regression - Latitude vs. Humidity
plt.scatter(north_lat, north_humidity, c = north_humidity, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Humidity (%)")
plt.title("Northern Hemisphere - Latitude vs. Humidity (%)")
plt.annotate(linear_r_plot(north_lat, north_humidity), (10, 85), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/northern_humidity.png")
plt.show()
```

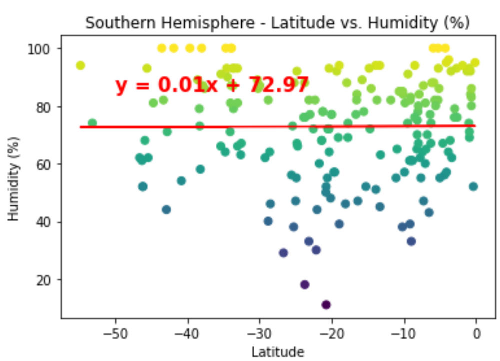
```
The r-squared is: 0.003023514192657079
```



Southern Hemisphere - Humidity (%) vs. Latitude Linear Regression

In [19]:
```
# Get humidity data on Southern Hemisphere
south_humidity = south_df.iloc[:, 4]

# Create a scatter plot with a linear regression - Latitude vs. Humidity
plt.scatter(south_lat, south_humidity, c = south_humidity, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Humidity (%)")
plt.title("Southern Hemisphere - Latitude vs. Humidity (%)")
plt.annotate(linear_r_plot(south_lat, south_humidity), (-50, 85), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/southern_humidity.png")
plt.show()
```

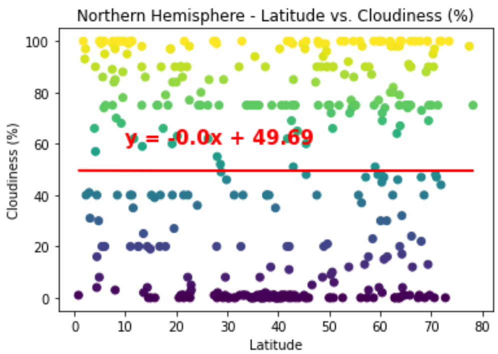
```
The r-squared is: 2.4464026951950943e-05
```



Northern Hemisphere - Cloudiness (%) vs. Latitude Linear Regression

In [20]:
```
# Get cloudiness data on Northern Hemisphere
north_cloudiness = north_df.iloc[:, 5]

# Create a scatter plot with a linear regression - Latitude vs. Cloudiness
plt.scatter(north_lat, north_cloudiness, c = north_cloudiness, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Cloudiness (%)")
plt.title("Northern Hemisphere - Latitude vs. Cloudiness (%)")
plt.annotate(linear_r_plot(north_lat, north_cloudiness), (10, 60), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/northern_cloudiness.png")
plt.show()
```

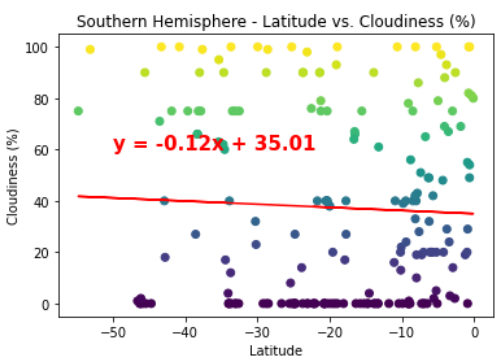
```
The r-squared is: 9.300700810529933e-07
```



Southern Hemisphere - Cloudiness (%) vs. Latitude Linear Regression

In [21]:
```
# Get cloudiness data on Southern Hemisphere
south_cloudiness = south_df.iloc[:, 5]

# Create a scatter plot with a linear regression - Latitude vs. Cloudiness
plt.scatter(south_lat, south_cloudiness, c = south_cloudiness, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Cloudiness (%)")
plt.title("Southern Hemisphere - Latitude vs. Cloudiness (%)")
plt.annotate(linear_r_plot(south_lat, south_cloudiness), (-50, 60), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/southern_cloudiness.png")
plt.show()
```

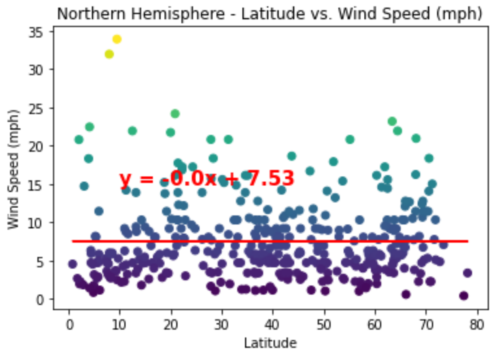
```
The r-squared is: 0.0020876397068019053
```



Northern Hemisphere - Wind Speed (mph) vs. Latitude Linear Regression

In [22]:
```
# Get wind speed data on Northern Hemisphere
north_wind_speed = north_df.iloc[:, 6]

# Create a scatter plot with a linear regression - Latitude vs. Cloudiness
plt.scatter(north_lat, north_wind_speed, c = north_wind_speed, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Wind Speed (mph)")
plt.title("Northern Hemisphere - Latitude vs. Wind Speed (mph)")
plt.annotate(linear_r_plot(north_lat, north_wind_speed), (10, 15), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/northern_wind_speed.png")
plt.show()
```

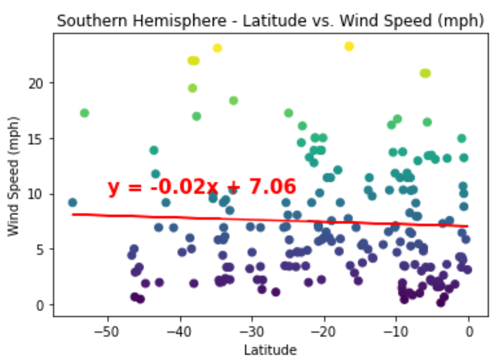
```
The r-squared is: 7.587334531907874e-06
```



Southern Hemisphere - Wind Speed (mph) vs. Latitude Linear Regression

In [23]:
```
# Get wind speed data on Southern Hemisphere
south_wind_speed = south_df.iloc[:, 6]

# Create a scatter plot with a linear regression - Latitude vs. Cloudiness
plt.scatter(south_lat, south_wind_speed, c = south_wind_speed, cmap = "viridis")
plt.xlabel("Latitude")
plt.ylabel("Wind Speed (mph)")
plt.title("Southern Hemisphere - Latitude vs. Wind Speed (mph)")
plt.annotate(linear_r_plot(south_lat, south_wind_speed), (-50, 10), fontsize = 15, color = "red", weight = "bold")
plt.savefig("../output_data/southern_wind_speed.png")
plt.show()
```

```
The r-squared is: 0.002331632699647725
```



Result

- The closer to the equator it is, the hotter weather it is.
  - The amount of sunshine received at the equator is more than other places.
- The higher latitude on the northern hemisphere and the lower latitude on the southern hemisphere it is, the colder temperature it is.
  - The reflection of the sun's rays and the amount of sunshine will affect the temperature.
- I wasn't able to find any correlation between latitude and wind speed, humidity, cloudiness.
  - I suppose wind speed, humidity and cloudiness would be affected by other factors such as precipitation or whether inland or waterfront.