1. Use the data set CPS_Econ317 to answer the following questions.
   a. Show graphically the distribution of wages. Describe your graph.
   
   ![Graph of wage distribution](image1)

   b. Show graphically the distribution of wages for those at or below the 95th percentile. Describe your graph.
   
   ![Graph of wage distribution below 95th percentile](image2)
c. What is the mean, median and standard deviation of the entire data set. How many observations are there?

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>wage</th>
<th>Smallest</th>
<th>Obs</th>
<th>Sum of Wgt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>5.3275</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>6.529285</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>7.692308</td>
<td>5</td>
<td>Obs 75543</td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>10.91476</td>
<td>5</td>
<td>Sum of Wgt. 75543</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>16.6667</td>
<td>Mean 22.18924</td>
<td>Largest</td>
<td>Std. Dev. 26.52544</td>
</tr>
<tr>
<td>75%</td>
<td>25</td>
<td>858.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td>38.46154</td>
<td>933.3333</td>
<td>Variance 703.5989</td>
<td></td>
</tr>
<tr>
<td>95%</td>
<td>50</td>
<td>1000</td>
<td>Skewness 10.90529</td>
<td></td>
</tr>
<tr>
<td>99%</td>
<td>135.7516</td>
<td>1000</td>
<td>Kurtosis 230.0396</td>
<td></td>
</tr>
</tbody>
</table>

2. Does College Pay?

a. What is the mean, median and standard deviation of wages for those with at most a high school degree (i.e., 12 years of schooling).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>$16.77</td>
<td>$13.89</td>
<td>$17.71</td>
<td>22,845</td>
</tr>
<tr>
<td>College</td>
<td>$28.69</td>
<td>$21.79</td>
<td>$31.86</td>
<td>15,527</td>
</tr>
<tr>
<td>Diff</td>
<td>$11.92</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Show graphically the distribution of wages of those with at most high school degree. Describe your results.

[Histogram showing wage distribution for high school and college degrees]

c. What is the mean, median and standard deviation of wages for those with at most a college degree (i.e., 16 years of schooling).

d. Show graphically the distribution of wages of those with at most a college degree. Describe your results.
e. Calculate the difference between the mean wage of college graduates and the mean wage of high school graduates.
f. Compare the standard deviation of wages of college graduates and high school graduates. Describe your results. Provide an explanation for your results.
g. Does college pay? Specifically, test the hypothesis that college graduates make more than high school graduates.
   i. Set up the null and alternative hypothesis. Explain each.

\[ H_0: \mu_{BA} - \mu_{HS} \leq 0 \] College graduates do not make more than high school graduates.
\[ H_1: \mu_{BA} - \mu_{HS} > 0 \] College graduates do make more than high school graduates.

ii. Calculate the critical value using a 5% level of significance. Compare your critical value with the sample value.

Critical wage differential \( (\bar{x}_{BA} - \bar{x}_{HS})^* \) using \( t_{df, \alpha} \):
\[
(\bar{x}_{BA} - \bar{x}_{HS})^* = H_0 + t_{df, \alpha} \cdot s_{\bar{x}_{BA} - \bar{x}_{HS}}
\]
\[
= 1.644893 \cdot (0.2542066)
\]
\[
= 0.4181 \text{ or } 42 \text{ cents.}
\]

Sample wage differential \( (\bar{x}_{BA} - \bar{x}_{HS}) \) = $11.92
Sample wage differential > critical wage differential, so reject the null hypothesis.

iii. Calculate the critical t-statistic. Compare your critical t-statistic with your sample t-statistic.

Critical \( t^* = 1.64 \)
Sample \( t = 46.9098 \)
Sample \( t > \text{Critical } t \), so reject the null hypothesis.

iv. Calculate the p-value. Explain.

\( p = 0 \)
\( p < \alpha \), so reject the null hypothesis.

v. Discuss the results of your test.

vi. Show your hypothesis test graphically. Note you can draw it by hand.