10. has Hamilton path since $F, B, A, E, C, D, G$ is a Hamilton path. 

has no Hamilton circuit since if we start at $G$, must go through $E$ to get to $A, B, F$. 

But to return to $G$, must pass through $E$ again, and we cannot!

18. (a) $19! = \frac{20!}{20}$, so $19! = \frac{2,432,902,008,176}{20} \approx 40,000$

(b) $\frac{20!}{19!} = \frac{20 \cdot 19!}{19!} = 20$ 

$\frac{20!}{19!} = \frac{20 \cdot 200 \cdot 199 \cdot 198 \cdots 2 \cdot 1}{199 \cdot 198 \cdots 2 \cdot 1} = 20 \cdot 200 = 40,000$
24. #1. Circuits in \( K_{26} = 25! \)

\[
= 15,511,210,048,330,984,984,000,000
\]

divide this by \# of seconds in a year, and also by a trillion

\[
\frac{25!}{(365 \times 24 \times 60 \times 60)(1,000,000,000,000)} \approx 49,185.7 \text{ years!}
\]

For \( K_{27} \), it is 26! or in other words 26 times the previous answer, so \( \approx 1,278,8300 \text{ years!} \)

28. (a) \( K_N \) has 720 #1. circuits, so \( (N-1)! = 720 \)

well, 6! = 720, so \( N-1 = 6 \), so \( N = 7 \).

(b) \( K_N \) has 66 edges, so \( \frac{N(N-1)}{2} = 66 \)

\[
N(N-1) = 132, \text{ 11.12 works, so } N = 12.
\]

(c) 80,200 edges, \( \frac{N(N-1)}{2} = 80,200 \)

\[
N(N-1) = 160,400 = 401 \times 400
\]

So \( N = 401 \)

To illustrate:

II. Prove that the 1-dimensional Hausdorff measure of a simple rectifiable curve in \( \mathbb{R}^n \) is equal...
30. \[ \begin{array}{c}
A \\
\downarrow \\
B \\
\downarrow \\
C
\end{array} \] 
(a) \(A, B, C, D, A\) cost 155
(b) \(A, B, D, C, A\) cost 190
(c) \(C, B, D, A, C\) cost 165
(d) \(D, B, C, A, D\) cost 165

Work for (c) (b)–(d) are all similar, (a) is just by looking hard.

Start at \(C\), nearest neighbor is \(B\), cost 25.
\[ \begin{array}{c}
B \\
\downarrow \\
A
\end{array} \]

at \(B\), n. n. is \(D\), cost 20
\[ = \frac{45 \text{ total}}{45} \]

at \(D\), n.n. is \(A\), cost 40 \[ = 85 \text{ total} \]

at \(A\), go to \(C\), cost 80 \[ = 165 \text{ total} \].

32. \[ \begin{array}{c}
A, E, B, C, D, A
\end{array} \] time = 113 minutes

(b) \(7\) both come out the same as (a), surprisingly!