HPC_HW_Chap2_PartC
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Problem 2.16
a)
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int n, p;
double Ts = n*n;
double Tp = n*n / p + log2(p);
double E = Ts / (p*Tp);
```

The general conclusion from the above program is:
When n is fixed, speedup and efficiency decreases as p increases.
When p is fixed, speedup and efficiency increases as n increases.

b)

$$\mathrm{E} = \frac{1}{p}\frac{T_s}{T_p} = \frac{T_s}{p\left(\frac{T_s}{p} + T_o\right)} = \frac{T_s}{T_s + pT_o}$$

$$\frac{dE}{dn} = p\frac{T_o\frac{dT_s'}{dn} - T_s\frac{dT_o'}{dn}}{(T_s + pT_o)^2}$$

When parallel efficiency increases, it requires $\frac{dE}{dn} > 0$, which leads to:

$$T_s' > \frac{T_s}{T_o}T_o'$$

And when efficiency decreases:

$$T_s' < \frac{T_s}{T_o}T_o'$$

Problem 2.19

$$\mathrm{E} = \frac{1}{p}\frac{T_s}{T_p} = \frac{n}{n + p(log_2p)} = \frac{n_1}{n_1 + (kp)(log_2kp)}$$

By solving the equation, we have,

$$\frac{n_1}{n} = \mathrm{k}\frac{log_2kp}{log_2p}$$

Therefore, with p=8, k=2, we get:

$$\frac{n_1}{n} = \frac{8}{3}$$

Problem 2.22

a) $\mathrm{r(total\ time) = u(user\ function\ costs) + s(system\ function\ costs)}$

b) $\mathrm{Total\ \ time = u + s + r}$

We are able to tell how much time is spent on waiting out of the total time.

c) ???