2.5.2 (a) It is positive because the temperature of the yam increases the longer it is in the oven.
   (b) The units of $f'(20)$ are °F/min. $f'(20) = 2$ means that when the yam has been in
   the oven 20 minutes, the temperature $T$ increases by approximately 2°F for each
   additional minute in the oven.

2.5.4 (a) The units of 5 are ml. The units of 18 are minutes. The statement that $f(5) = 18$
   tells us that if 5 milliliters of the catalyst are present, then the chemical reaction
   takes 18 minutes.
   (b) The units of 5 are ml. The units of $-3$ are minutes/milliliter. The statement
   that $f'(5) = -3$ tells us that when 5 milliliters of the catalyst are present, for
   each additional milliliter of catalyst added, the reaction will take approximately
   3 minutes fewer.

2.5.10 (a) If the price is $150, then 2000 items will be sold.
   (b) If the price goes up from $150 by $1 per item, about 25 fewer items will be sold.
   Equivalently, if the price is decreased from $150 by $1 per item, about 25 more
   items will be sold.

2.5.14 (a) The statement $f(140) = 120$ means that a patient weighing 140 pounds should
   receive a dose of 120 milligrams of the painkiller.
   The statement $f'(140) = 3$ means that for a patient who weighs 140 pounds, the
dose increases by approximately 3 mg for each pound over 140.
   (b) For a 145 lb patient, the correct dose is approximately 135 mg.

2.6.1 (a) Since the graph is below the x-axis at $x = 2$, $f(2)$ is negative.
   (b) Since $f(x)$ is decreasing at $x = 2$, $f'(2)$ is negative.
   (c) Since $f(x)$ is concave up at $x = 2$, $f''(2)$ is positive.

2.6.3 At $B$ both $dy/dx$ and $d^2y/dx^2$ are positive. At $B$ the graph is increasing, so $dy/dx > 0$.
The graph is also concave up at $B$, so $d^2y/dx^2 > 0$.

2.6.12 $f'(x) > 0$, $f''(x) < 0$

2.6.13 $f'(x) < 0$, $f''(x) < 0$

2.6.17 (a) $dP/dt > 0$ and $d^2P/dt^2 > 0$.
   (b) $dP/dt < 0$ and $d^2P/dt^2 > 0$ (but $dP/dt$ is close to zero).
2.6.18 (a)

(b) As a function of quantity, utility is increasing but at a decreasing rate; the graph is increasing but concave down. So the derivative of utility is positive, but the second derivative of utility is negative.

2.6.22 (a) $x_6$ (b) $x_1$ (c) $x_3$ (d) $x_2$ (e) $x_6$ (f) $x_1$

Since $f'$ is positive everywhere, $f$ is increasing everywhere. Hence the greatest value of $f$ is at $x_6$ and the least value of $f$ is at $x_1$. Directly from the graph, we see that $f'$ is greatest at $x_3$ and least at $x_2$. Since $f''$ gives the slope of the graph of $f'$, $f''$ is greatest where $f'$ is rising most rapidly, namely at $x_6$ and $f''$ is least where $f'$ is falling most rapidly, namely at $x_1$.

2.7.2 (a) Function $g$ appears continuous at all $x$-values shown.

(b) Function $g$ appears not differentiable at $x = 2$ and $x = 4$. At $x = 2$, the curve has a vertical tangent line, so the derivative doesn’t exist. At $x = 4$, the graph has a sharp corner, so the derivative doesn’t exist.

2.7.4 No, there are sharp turning points.

2.7.10 (a) The graph is concave up everywhere, except at $x = 2$ where the derivative is undefined. This is the case if the graph has a corner at $x = 2$. One possible graph:

(b) The graph is concave up for $x < 2$ and concave down for $x > 2$, and the derivative is undefined at $x = 2$. This the case if the graph has a vertical tangent line at $x = 2$. One possible graph: