Problem B. Where is a function continuous?

(1) all \( x \)  
(2) all \( x \)  
(3) \( x \neq 0 \)  
(4) \( x \neq 0 \)  
(5) \( k = \frac{2}{5} \)  
(6) \( 1 \leq x \leq 3 \)  
(7) \( x \neq 0 \)  
(8) \( x \neq 0 \)  
(9) \( a = -2 \)  
(10) \( x \geq 0, x \neq 1 \)  
(11) all \( x \)  
(12) \( a = 3 \)  
(13) \( x \neq a \)  
(14) \( x \neq 0 \)  
(15) all \( x \)  
(16) all \( x \)  
(17) all \( x \)  
(18) all \( x \)  
(19) \( x \) not an integer  
(20) \( x \neq 1 \)  
(21) \(-1 \leq x \leq 2\)

Problem D. Increasing, decreasing, and concavity.

(9) \( 1 \)  
(10) \( a = 3 \) and \( b = 5 \)

Problem E. Graphing polynomials.

(1) Defined for all \( x \); continuous for all \( x \); differentiable for all \( x \); increasing nowhere; decreasing nowhere; concave up nowhere; concave down nowhere; all \( x \) are critical points; no points of inflection; \( y = a \) is an asymptote.

(2) Defined for all \( x \); continuous for all \( x \); differentiable for all \( x \); increasing for all \( x \) if \( a > 0 \); decreasing for all \( x \) if \( a < 0 \); concave up nowhere; concave down nowhere; all \( x \) are critical points if \( a = 0 \) and there are no critical points if \( a \neq 0 \); no points of inflection; \( y = ax + b \) is an asymptote.

(3) Same as (2).

(4) Defined for \( x \geq 0 \); continuous for \( x \geq 0 \); differentiable for \( x \neq 1 \); increasing for \( 0 < x < 1 \); decreasing for \( x > 1 \); concave up nowhere; concave down nowhere; critical points at \( x = 1 \) and \( x = 0 \); no points of inflection; \( y = 2 - x \) is an asymptote as \( x \to \infty \).
(5) Defined for all $x$; continuous for all $x$; differentiable for $x \neq 0$; increasing for $x > 0$; decreasing for $x < 0$; concave up nowhere; concave down nowhere; critical point at $x = 0$; no points of inflection; $y = 2 + x$ is an asymptote as $x \to \infty$, $y = 2 - x$ is an asymptote as $x \to -\infty$.

(6) Defined for all $x$; continuous for all $x$; differentiable for $x \neq 1$; increasing for $x > 1$; decreasing for $x < 1$; concave up for $x > 1$; concave down nowhere; critical point at $x = 1$; no points of inflection; $y = 1 - x$ is an asymptote as $x \to -\infty$.

(7) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 1$; decreasing for $x > 1$; concave up for $x > 1$; concave down nowhere; critical point at $x = 1$; no points of inflection; no asymptotes.

(8) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 1/2$; decreasing for $x > 1/2$; concave up nowhere; concave down for all $x$; critical point at $x = 1/2$; no points of inflection; no asymptotes.

(9) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x > 1/3$; decreasing for $x < 1/3$; concave up for all $x$; concave down nowhere; critical point at $x = 1/3$; no points of inflection; no asymptotes.

(10) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for all $x$; decreasing nowhere; concave up for $x > 0$; concave down for $x < 0$; critical point at $x = 0$; point of inflection at $x = 0$; no asymptotes.

(11) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < -1/\sqrt{3}, x > 1/\sqrt{3}$; decreasing for $-1/\sqrt{3} < x < 1/\sqrt{3}$; concave up for $x > 0$; concave down for $x < 0$; critical points at $x = \pm 1/\sqrt{3}$; point of inflection at $x = 0$; no asymptotes.

(12) Same as (11).

(13) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 4/3, x > 2$; decreasing for $4/3 < x < 2$; concave up for $x > 5/3$; concave down for $x < 5/3$; critical points at $x = 2$ and $x = 4/3$; point of inflection at $x = 5/3$; no asymptotes.

(14) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 1, x > 6$; decreasing for $1 < x < 6$; concave up for $x > 7/2$; concave down for $x < 7/2$; critical points at $x = 6$ and $x = 1$; point of inflection at $x = 7/2$; no asymptotes.

(15) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < -5/3, x > 2$; decreasing for $-5/3 < x < 2$; concave up for $x > 1/6$; concave down for $x < 1/6$; critical points at $x = -5/3$ and $x = 2$; point of inflection at $x = 1/6$; no asymptotes.
(16) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 0$; decreasing for $x > 0$; concave up nowhere; concave down for all $x$; critical points at $x = 0$; no points of inflection; no asymptotes.

(17) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $-1 < x < 0$ and $x > 2$; decreasing for $x < -1$ and $0 < x < 2$; concave up for $x$ less than about $-1/2$, and for $x$ greater than about 1.2; concave down for $x$ between about $-1/2$ and 1.2; critical points at $x = -1$, $x = 0$ and $x = 2$; points of inflection at about $-1/2$ and about 1.2; no asymptotes.

(18) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $0 < x < 1$ and $x > 3$; decreasing for $x < 0$ and $1 < x < 3$; concave up for $x$ less than about $1/2$, and for $x$ greater than about 2.2; concave down for $x$ between about $1/2$ and 2.2; critical points at $x = 0$, $x = 1$ and $x = 3$; points of inflection at about $1/2$ and about 2.2; no asymptotes.

(20) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x < 1.2$ and $x > 2$; decreasing for $1.2 < x < 2$; concave up for $x$ between 0 and about 1, and for $x$ greater than about 1.3; concave down for $x < 0$ and $x$ between about 1 and 1.3; critical points at $x = 0$, $x = 1.2$ and $x = 2$; points of inflection at $x = 0$ and $x$ about 1 and about 1.3; no asymptotes.

(21) Defined for all $x$; continuous for all $x$; differentiable for all $x$; increasing for $x > 0$ and less than about 1.2 and for $x > 2$; decreasing for $x < 0$ and between about 1.2 and 2; concave up for $x$ less than about $-.9$ and between about $-.5$ and $.5$ and for $x$ greater than about 1.5; concave down for $x$ between about $-.9$ and $-.5$ and between about $.5$ and 1.5; critical points at $x = 0$, $x = 2$ and approximately $-.9$ and $1.2$; points of inflection at approximately $-.9$, $-.5$, $$.5$ and 1.5; no asymptotes.