Quiz6, MAT1375 Professor Chiu

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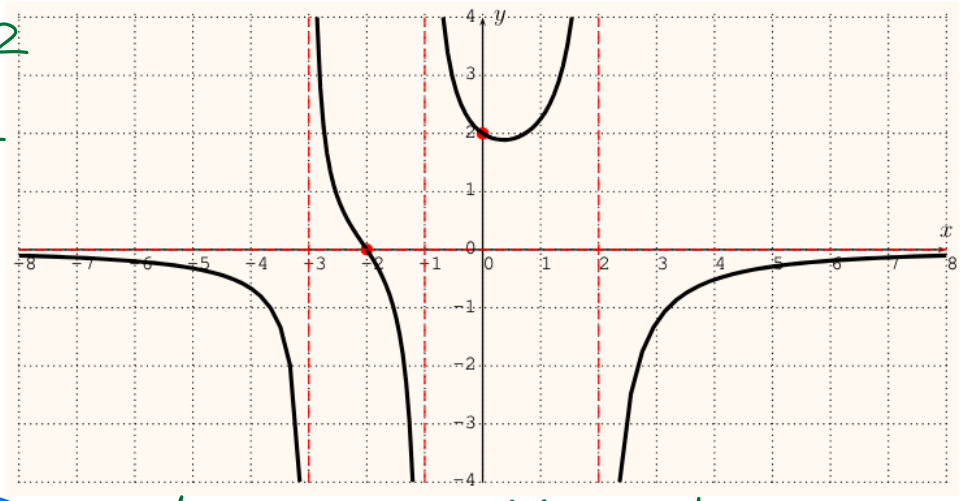
- This quiz consists of 2 sets of questions for a total of 10 points.
- You have 15 minutes to complete the quiz.
- Wishing you success.

True or False. Circle your answers (either T (true) or F (false)) on this sheet.

1. (T / F) Let $f(x)=\frac{(x-2)(x+3)}{x-3}$. Then $x=3$ is a vertical asymptote of $f(x)$.
2. (T / F) Let $f(x)=\frac{3x-2}{x-3}$. Then $y=3$ is a horizontal asymptote of $f(x)$.
3. (T / F) Let $f(x)=\frac{x^2-2}{x-3}$. Then there is no horizontal asymptote of $f(x)$.
4. (T / F) Let $f(x)=\frac{(x-2)(x-3)}{x-3}$. Then $x=3$ is a vertical asymptote of $f(x)$. → Removable discontinuity
5. (T / F) Let $f(x)=x-3+\frac{9}{x+3}$. Then $y=x-3$ is a slant asymptote of $f(x)$. ↑ deg 1, so it is a slant.

Show all your work and justify your answer:

6. The graph of $f(x)=\frac{p(x)}{q(x)}$ is displayed below, where $\deg(p(x))=1$ and $\deg(q(x))=3$. All intercepts and asymptotes are at integer values. Find all intercepts, asymptotes, and a formula for $f(x)$.



① X-intercept (-2, 0) or $x=-2$

② y-intercept (0, 2) or $y=2$

③ Horizontal Asymptote the line $y=0$

④ Vertical Asymptotes the lines $x=-3$, $x=-1$, $x=2$

⑤ NO Removable discontinuity

⑥ Find $f(x)=\frac{p(x)}{q(x)}$

- From ④ V.A, we know that $(x+3)$, $(x+1)$, $(x-2)$ are 3 factors of $q(x) \Rightarrow q(x)=(x+3)(x+1)(x-2)$
- From ① X-intercept, we know that $(x+2)$ is a factor of $p(x) \Rightarrow p(x)=a(x+2)$ where a to be determined.
- Now $f(x)=\frac{a(x+2)}{(x+3)(x+1)(x-2)}$

From ② y-intercept, we know $f(0)=2$

$$\Rightarrow 2=f(0)=\frac{a(0+2)}{(0+3)(0+1)(0-2)}=\frac{2a}{3(1)(-2)}=\frac{2a}{-6}$$

$\Rightarrow 2=\frac{2a}{-6} \Rightarrow -12=2a, \Rightarrow a=-6$

Thus $f(x)=\frac{-6(x+2)}{(x+3)(x+1)(x-2)}$