Quiz on 4.5 & 5.1 & Review
Solutions

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Date: 26 Oct. 04 **Tom LaGatta**

Read all instructions carefully. Read all the questions first so you can manage your time best.
The total time for this quiz is 20 minutes. The test will be worth 20 points
You will turn in only the answer sheet, so make sure all your work and answers are on the answer sheet. Put your name at the top of every page.
Watch for trick questions!

Part A
Multiple Choice. (You do not have to show work).

1. (2 points) Given $M(x) = \frac{4x^2+4x-8}{x^2-7x+12}$, find the SUM of the zeros of M.

Answer choices

A. -2	B. -1	C. 0
D. 1	E. 2	F. None of the above.

Solution

Answer: B. Factor $M(x) = \frac{4(x-1)(x+2)}{(x-3)(x-4)}$. M has a zero when top $= 0$ and bottom $\neq 0$, so the zeros are $x = 1$ and -2. The sum is then $1 - 2 = -1$.

2. (2 points) Given M as above, find where M has a hole, if anywhere.

Answer choices

A. $(1,0)$	B. $(-2,0)$	C. $(3,0)$
D. $(4,0)$	E. $(0,0)$	F. None of the above.

Solution

Answer: F. M has a potential (but not definite) hole when top $= 0$ and bottom $= 0$, but this does not happen in this case.

3. (2 points) Given M as above, find the horizontal or slant asymptote of M, if it exists.

Answer choices

A. $y = 2$	B. $y = -24x - 56$	C. $y = 4$
D. $y = 24x + 40$	E. $y = 0$	F. None of the above.

Solution

Answer: C. deg top = deg bottom, so M has a horizontal asymptote. Since for horizontal asymptotes we only care about the leading terms of the top and the bottom, we have an asymptote at $y = 4$.

We could also get this result by dividing the top and bottom by x^2 to get

$$\frac{4+\frac{4}{x}-\frac{8}{x^2}}{1-\frac{7}{x}+\frac{12}{x}}.$$

As x gets large, the subfractions go to 0, so $M \to y = 4$.

4. (2 points) Given $G(x) = \frac{2x^2-3x-2}{2x+1}$, find the SUM of the zeros of M.

Answer choices

A. -2	B. -3/2	C. 0
D. 3/2	E. 2	F. None of the above.

Solution

Answer: E. Factor $G(x) = \frac{2(x+\frac{1}{2})(x-2)}{2(x+\frac{1}{2})}$. G has a zero when top $= 0$ and bottom $\neq 0$, so the only zero is at $x = 2$. The sum is then 2.

5. (2 points) Given G as above, find where G has a hole, if anywhere.

Answer choices

A. $(1/2, -5/2)$	B. $(-1/2, -5/2)$	C. $(2, 0)$
D. $(-1/2, -3/2)$	E. $(1/2, -3/2)$	F. None of the above.

Solution

Answer: B. G has a potential (but not definite) hole when top $= 0$ and bottom $= 0$, which happens at $x = -\frac{1}{2}$. Cancelling the factor $(x+\frac{1}{2})$ from the top and bottom of G, we get $\frac{2(x-2)}{2} = x - 2$. Plugging in $x = -\frac{1}{2}$, we get a hole at $(-\frac{1}{2}, -5/2)$.

6. (2 points) Given M as above, find the horizontal or slant asymptote of M, if it exists.

Answer choices

A. $y = -4x - 2$	B. $y = 0$	C. $y = x - 2$
D. $y = 1$	E. $y = -2x - 2$	F. None of the above.

Solution

Answer: C. deg top = deg bottom + 1, so M has a slant asymptote. Since $2(x+\frac{1}{2})$ cancels from the top and bottom, $G(x) = x - 2$ as long as $x \neq 2$ (there point where there is a hole). So the slant asymptote is $y = x - 2$.

We could also get this result by doing long division, in which case we would have

$$G(x) = \frac{2x^2 - 3x - 2}{2x + 1} = (x - 2) + \frac{0}{2x + 1}.$$

7. (2 points) For the polynomial function $f(x) = 3x^5 - 18x^3 + 16.2x$, which of the following are true?

(i) $f(x)$ is an odd degree polynomial.

(ii) $f(x)$ is an even degree polynomial.

(iii) $f(x)$ is neither an even function nor an odd function.

Answer choices

A. i.	B. ii.	C. iii.	D. i, ii, and iii
E. i and ii	F. i and iii	G. ii and iii	H. None of the above.

Solution

Answer: A. f has degree 5, so (i) is true and (ii) is false. f is an odd function, so (iii) is false.

8. (2 points) If $f(x) = ax^2 + bx + c$, and $b^2 - 4ac = 0$, then the graph of $y = f(x)$ intersects the x-axis exactly once.

Answer choices

A. True   B. False

Solution

Answer: A. This is true by the quadratic formula.

9. (2 points) If $f(x) = \frac{x^2-3x+2}{x-1}$ and $g(x) = \sqrt{x-2}$, then what is the domain of $(fg)(x) = (f \cdot g)(x)$?

Answer choices

A. $\mathbb{R}$	B. $\{x \mid x \neq 1\}$	C. $\{x \mid x \neq -1, x > 2\}$
D. $\{x \mid x \geq 2\}$	E. $\{x \mid x > 2\}$	F. None of the above.

Solution

Answer: D. The domain of fg is the intersection of the domain of f and the domain of g. That is, if x works for f and g, then it also works for fg. The domain of f is $x \neq 1$ and the domain of g is $x \geq 2$, so the combined domain will be $x \geq 2$ (since $1 < 2$, we can ignore $x \neq 1$).

10. (2 points) If $f(x) = \frac{x^2-3x+2}{x-1}$ and $g(x) = \sqrt{x-2}$, then what is the domain of $(f \div g)(x)$?

Answer choices

A. $\mathbb{R}$	B. $\{x \mid x \neq 1\}$	C. $\{x \mid x \neq -1, x > 2\}$
D. $\{x \mid x \geq 2\}$	E. $\{x \mid x > 2\}$	F. None of the above.

Solution

Answer: E. The domain of $f \div g$ is the intersection of the domain of f and the domain of g, except where $g(x) = 0$. That is, if x works for f and g, AND $g(x) \neq 0$, then it also works for $f \div g$. The domain of f is $x \neq 1$ and the domain of g is $x \geq 2$, AND $g(x) = 0$ only when $x = 2$, so the combined domain will be $x > 2$ (since $1 < 2$, we can ignore $x \neq 1$).