ALGEBRA 2 IM INTERIM RUBRICS

CENTERPOINT EDUCATION SOLUTIONS

Algebra 2 Interim A, #11

4 Points:

Student response includes the following:

- Correct expressions for the factors
- Correct explanation for determining the factors based on the given information
- Correct values for the solutions
- Correct explanation to support the solutions

Sample Student Response:

Since $p(x)$ divided by $(x-2)$ is 0, then dividing $(x-2)$ into $p(x)$ gives no remainder. This means $(x-2)$ is a factor of $p(x)$ and $p(2)=0$. Similarly, since $p(x)$ divided by $(x+1)$ is 0, then $(x+1)$ is a factor of $p(x)$ and $p(-1)=0$. I can then use polynomial or synthetic division to find the remaining factors of $p(x)$.

Dividing $p(x)$ by the first factor $(x-2)$ gives x^3+4x^2-x-4. Then dividing again by the second factor $(x+1)$ gives x^2+3x-4. This factors into $(x+4)(x-1)$. So the factors of $p(x)$ are $(x-2)$, $(x+1)$, $(x+4)$, and $(x-1)$.

The solutions are when $p(x)=0$. Since $p(x)=(x-2)(x+1)(x+4)(x-1)$, I can set each factor equal to 0 and solve for x to get the solutions, which are $x=2$, $x=-1$, $x=-4$, and $x=1$.

3 Points:

3 elements correct.

2 Points:

2 elements correct.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.

Algebra 2 Interim A, #12

3 Points:

Student response includes the following:

- Correct response and justification showing that Felicia has a higher maximum heart rate (155 vs. 100 beats per minute)
- Correct justification to determine the average rate of change of Glenn and Felicia's heart rates
- Correct response based on correct justification: the average rate of change Glenn's heart rate is greater than Felicia's (since 1.5 > 0)

Sample Student Response:

Since Felicia's heart rate is modeled by a quadratic function whose graph opens down, I know that her maximum heart rate is at the vertex of the parabola. This is given by the constant 155 in the equation. This means her maximum heart rate is 155 beats per minute. Glenn's heart rate is modeled by an increasing linear function, so his maximum heart rate is achieved at the end of the 10 minutes. Evaluating g(10) gives a value of 100, so his maximum heart rate is 100 beats per minute. Thus, Felicia achieves the higher maximum heart rate.

Since Glenn's heart rate is modeled by a linear function, I know his average rate of change is the slope which is 1.5 beats per minute per minute.

To find Felicia's average rate of change, I evaluate f(0) = 80 and f(10) = 80. Thus, her average rate of change is 0 beats per minute per minute. So, Glenn has the greater average rate of change.

2 Points:

2 elements correct.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.

Algebra 2 Interim B, #11

3 Points:

Student response includes the following:

- Reasoning: correct and complete explanation
- Reasoning: correct number of solutions, 3
- Reasoning: correct verification of one exact solution

Sample Student Response:

The number of solutions can be determined by seeing where the graphs intersect. Since the graphs intersect at 3 locations, there are 3 solutions. One of those solutions is $x = -2$ because $g(-2) = h(-2)$ as shown below.

$g(-2) = 0.5^{-2} - 2$

$g(-2) = 2$

$h(-2) = (-2)^3 - 5(-2)$

$h(-2) = 2$

2 Points:

2 elements correct.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.

Algebra 2 Interim B, #12

3 Points:

Student response includes the following:

- Correct model that is **not** specific to a starting time of 1 minute 42 seconds
- Correct domain statement that fits the model
- Correct estimate showing that the qualifying time is achievable

Sample Student Response:

Since the time can be reduced by 1.5% per month, this means the time each month is 98.5% of the time of the previous month. A model that could be used to estimate the times for any given month would be $T(m) = A(0.985)^m$, where A is the race time the swimmer started with, and m is the month number. The domain of the model is integers from 1 to 12 since he has only 12 months to meet his goal.

If his start time for a certain event is 1 minute and 42 seconds, then converting to seconds gives 102 seconds. Substituting into the model for the 12th month gives

$T(12) = 102(0.985)^{12}$

$T(12) = 85.08$

Converting to minutes gives 1 minute 26.38 seconds. Since the qualifying time is 1 minute 30 seconds, he will qualify for the state event.

Notes:

- The task specifically asks for a general model; thus, a general model is required to receive full credit. If the only model given is for a 102 second (or equivalent) start time, then at most 2 points are earned.
- A correct estimate based on an incorrect, but reasonable model satisfies the third component. A reasonable estimate is one for which the time is less than 102 seconds.
- Any valid general model provided should be accepted. This includes continuous models such as $R(t) = Se^{(-.015t)}$ where $R(t)$ is his race time in seconds after practicing for t months and S is his initial race time in seconds.
- Other domain restrictions are appropriate with the correct justification. For example, real numbers greater than or equal to zero and less than or equal to 12 is acceptable since time is continuous across the 12-month period.

Algebra 2 Interim B, #12 (continued)

2 Points:

2 elements correct.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.

Algebra 2 Interim C, #11

2 Points:

Student response includes the following:

- Computation: 15 radians is more than 2 full revolutions around a unit circle and finds the measure, x, of a co-terminal angle where $0 < x < 360$ degrees or $0 < x < 2\pi$ radians (140 degrees or 2.433 radians)
- Valid reasoning: the angle measure is between 90 and 180 degrees, or 1.57 and 3.14 radians, and thus terminates in the 2nd quadrant

OR

- Valid reasoning based on $\cos(15) < 0$
- Valid reasoning based on $\sin(15) > 0$

Sample Student Response 1:

I converted radians to degrees by multiplying 15 radians by 180/pi, which is 860 degrees. I can subtract 360 degrees twice to get 140 degrees, since there are 360 degrees in one revolution of a circle. Since 140 degrees is between 90 and 180 degrees, point P is in quadrant 2 after the rotation.

Sample Student Response 2:

I took the cosine of 15 and found that the value is less than 0. This means point P must be in either quadrant 1 or 2. Next I took sine of 15 and found that the value is greater than 0. This meant point P had to be in quadrant 2 or 3. Putting this together means point P must be in quadrant 2 after the rotation.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.

Algebra 2 Interim C, #12

3 Points:

Student response includes the following:

- Valid model
- Correct and complete justification of the model
- Correct height at 4.25 seconds, 9.83 feet

Sample Student Response:

The situation described is periodic in nature with Mikala returning to the high point in her swing at regular intervals. Since the situation asks for a model beginning when she is at the high point, a cosine function should be used. The function should have an amplitude of 4 feet and a period of 2 seconds with a minimum value of 3. The function $h(x) = 4\cos(\pi x) + 7$ models this situation where x is time in seconds since first achieving maximum height, and h(x) is the height in feet. Substituting 4.25 for x in the function gives a height of 9.83 feet at 4.25 seconds after first reaching maximum height.

Note: The given equation is one acceptable model. Other trigonometric models are possible. Any model which correctly represents the situation should receive credit for the first point, and if appropriately justified, the second point.

2 Points:

2 elements correct.

1 Point:

1 element correct.

0 Points:

Incorrect or irrelevant response.