Which expressions share a graph?

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

Let $f(x) = (x^2 - 4)/(x - 2)$. Let $g(x) = x + 2$. Consider real inputs.

1. At which input is f undefined?

- ○ A -2
- ○ B 2
- ○ C 0
- ○ D 4

2. Which point lies on g but is absent from f?

- ○ A (0,2)
- ○ B (−2,0)
- ○ C (4,6)
- ○ D (2,4)

3. Solve f(x) = 0 and explain why multiplying through by the denominator can produce a candidate you must reject.

Trial runs at a station

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A machine has a failure probability of 0.10 on each run. The model assumes independent runs with the same probability.

4. What is the probability of no failures in four runs?

- ○ A 0.1^4
- ○ B 0.9^4
- ○ C $4(0.1)$
- ○ D $1 - 0.9^4$

5. Which observation would most directly call independence into question?

- ○ A Failures cluster immediately after a preceding failure
- ○ B The sample contains both outcomes
- ○ C The proportion varies slightly between samples
- ○ D Some groups of four have zero failures

6. Find the probability of exactly one failure in four runs. Show why the number of possible positions matters.

Two representations of a cycle

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A temperature model is $T(t) = 12 + 5\cos(\pi t/6)$, where t is measured in hours and the cosine argument is in radians. Temperature is in °C.

7. What is the period?

- ○ A 6 hours
- ○ B 2π hours
- ○ C 12 hours
- ○ D 5 hours

8. At what positive time does the model first reach its minimum?

- ○ A 6 hours
- ○ B 12 hours
- ○ C 3 hours
- ○ D 9 hours

9. A sensor reads 12 °C at two different times in the first cycle. Find both times and explain what differs about the temperature trend.

Cooling between readings

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A sample temperature is C(t) = 18 + 72(1/2)^(t/8), with t in minutes after cooling starts. A machine may resume at 30 °C or colder.

10. Which temperature does the model approach over time?

- ○ A 0 °C
- ○ B 72 °C
- ○ C 18 °C
- ○ D 90 °C

11. What quantity halves every eight minutes?

- ○ A The ambient temperature
- ○ B The entire sample temperature
- ○ C The elapsed time
- ○ D The difference between sample and ambient temperature

12. Find the average rate of change over the first 16 minutes and interpret it. Find the earliest whole minute at which the machine may resume. Justify the rounding decision.