8.7 Lesson Master

**Questions on SPUR Objectives**

**Properties**

<table>
<thead>
<tr>
<th>Objective</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>**In 1–6, state whether the given infinite geometric series is convergent or divergent. **If the series is convergent, give its sum.</td>
<td>convergent; 18</td>
</tr>
<tr>
<td>1.</td>
<td>$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots$</td>
</tr>
<tr>
<td>2.</td>
<td>$\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \cdots$</td>
</tr>
<tr>
<td>3.</td>
<td>$\frac{5}{3} + \frac{10}{9} + \frac{20}{27} + \cdots$</td>
</tr>
<tr>
<td>4.</td>
<td>$\frac{2}{11} + \frac{4}{33} + \frac{8}{66} + \cdots$</td>
</tr>
<tr>
<td>5.</td>
<td>$\frac{2}{3} + \frac{3}{9} + \frac{4}{27} + \cdots$</td>
</tr>
<tr>
<td>6.</td>
<td>$\frac{3}{5} + \frac{9}{25} + \frac{27}{125} + \cdots$</td>
</tr>
</tbody>
</table>

7. Rewrite $\frac{3}{10} \times a_n$ as the sum of a finite decimal and a geometric series. Explain how you know it converges.

8. $4.5 + 5.4 + 6.3 + 7.2 + \cdots$ converges because it is a number plus a geometric series with constant ratio $-\frac{1}{2} < \frac{1}{10} < 1$.

In 8–10, use a CAS to conjecture whether the series is convergent or divergent. If convergent, give what seems to be its limit.

- Convergent; 7
- Divergent
- Divergent

**Uses**

Objectives H

12. Suppose that the second hand on a ticking clock is fixed and does not rotate by a uniform amount on each tick. After the first tick of 6 degrees, the rotation decreases by 5% on each successive tick.

a. How far will the second hand rotate if the clock is left ticking forever?

b. Assuming it was initially pointing to 12, where will the second hand be pointing after one hour?

19 minutes past the hour

**9.2 Lesson Master**

**Questions on SPUR Objectives**

**Skills**

<table>
<thead>
<tr>
<th>Objective</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 1 and 2, evaluate without a calculator.</td>
<td>$\sqrt[3]{27}$</td>
</tr>
<tr>
<td>1.</td>
<td>$\sqrt{4}$</td>
</tr>
<tr>
<td>2.</td>
<td>$\sqrt[3]{27}$</td>
</tr>
</tbody>
</table>

In 3 and 4, rewrite the expression without a radical sign. Assume all variables are positive.

- $\sqrt{x^2}$
- $\sqrt{p^2q^2}$
- $\sqrt{a^2b^2}$
- $\sqrt{p^2+q^2}$ or $\sqrt{27}$

**Properties**

Objectives D

7. Give the domain and range of the function $f(x) = \sqrt{x}$.

8. What restrictions can be placed on the domain of $g(x) = x^2$ so that its inverse is an onto function?

**Uses**

Objectives H

9. The weight $W$ of a steel ball bearing varies directly with the cube of the bearing's radius $r$ according to the formula $W = \frac{32}{5} r^3$, where $p$ is the density of the steel. The surface area of a bearing varies directly as the square of its radius because $A = 4\pi r^2$.

- Express the weight $W$ of a bearing in terms of its surface area.
- Express the bearing's surface area $A$ in terms of its weight.
- Use steel, $p = 7.20$ g/cm$^3$. What is the surface area of a bearing weighing 0.12 g?

**Representations**

Objectives K

- Objective $K$

11. Suppose $f(x) = g(x) = x^2$.

- State the range of $f$.
- Find an equation for $g(x) = x^2$.

- Graph $f(x)$ and its inverse $g(x)$.