DO NOW

Answers: pg 245
28. -1
30. 3
32. 3
34. 1
36. 2

Worksheet 4.5
1. $y = 7$
2. $y = 0$
3. $y = 1/6$
4. $y = 0$
5. none
6. $y = -1$
7. $y = 3/4$
8. none
9. $y = 0$
10. none

Page 1

8.7 Indeterminate Forms and L'Hôpital's Rule

Simplifying with Infinity: Let r be a number larger than 0.

$\infty + r = \infty$ $\quad \infty - r = \infty$

$\infty + \infty = \infty$ $\quad -\infty - \infty = -\infty$

$r\infty = \infty$ $\quad -r\infty = -\infty$

$\infty(\infty) = \infty$ $\quad \infty(-\infty) = -\infty$

$0^{\infty} = 0$ $\quad 0^{-\infty} = \infty$

Indeterminate Forms: obtained in context of limits
- does not give enough information to determine limits

$\frac{\infty}{\infty}$ $\frac{0}{0}$ $0 \cdot \infty$ 1^{∞} ∞^{0} 0^{0}

Page 2

L'Hôpital's Rule:

If $f(x)$ and $g(x)$ are differentiable on (a,b), except possibly at some fixed point c in (a,b) and $g'(x) \neq 0$ on (a,b) except possibly at $x=c$ and $\lim_{x\to c} \frac{f(x)}{g(x)}$ has indeterminate form $\frac{0}{0}$ or $\frac{\infty}{\infty}$ and that the limit exists

then $\lim_{x\to c} \frac{f(x)}{g(x)} = \lim_{x\to c} \frac{f'(x)}{g'(x)}$

Page 3

Find the limit:

1. $\lim_{x\to -1} \frac{2x^2 - 2}{x + 1}$ $\frac{0}{0}$

Chpt2: $\lim_{x\to -1} \frac{2(x^2-1)}{x+1}$

$\lim_{x\to -1} \frac{2(x+1)(x-1)}{x+1}$

$\lim_{x\to -1} 2(x-1)$

-4

l'hopital's: $\lim_{x\to -1} \frac{4x}{1}$

-4

2. $\lim_{x\to \infty} \frac{3x^2 - 1}{2x^2 + 1}$ $\frac{\infty}{\infty}$

Sec 4.5: $\lim_{x\to\infty} \frac{\frac{3x^2}{x^2} - \frac{1}{x^2}}{\frac{2x^2}{x^2} + \frac{1}{x^2}}$

$\lim_{x\to\infty} \frac{3 - \frac{1}{x^2}}{2 + \frac{1}{x^2}}$

$\frac{3}{2}$

l'hopital's: $\lim_{x\to\infty} \frac{6x}{4x}$ $\frac{\infty}{\infty}$

$\lim_{x\to\infty} \frac{6}{4}$

$\frac{3}{2}$

Page 4

3. $\lim_{x\to 0} \frac{e^{2x} - 1}{e^x - 1}$ $\frac{0}{0}$

Chpt2: $\lim_{x\to 0} \frac{(e^x-1)(e^x+1)}{e^x-1}$

$\lim_{x\to 0} e^x + 1$

2

l'Hopital's: $\lim_{x\to 0} \frac{2e^{2x}}{e^x}$

$\frac{2e^0}{e^0}$

2

4. $\lim_{x\to 0} \frac{e^{2x} - 1}{x}$ $\frac{0}{0}$

NO OLD WAY

l'Hopital's: $\lim_{x\to 0} \frac{2e^{2x}}{1}$

$\frac{2e^0}{1}$

2

Page 5

5. $\lim_{x\to\infty} \frac{\ln x}{x}$ $\frac{\infty}{\infty}$

$\lim_{x\to\infty} \frac{\frac{1}{x}}{1}$

$\lim_{x\to\infty} \frac{1}{x}$

0

6. $\lim_{x\to -\infty} \frac{x^2}{e^{-x}}$ $\frac{\infty}{\infty}$

$\lim_{x\to -\infty} \frac{2x}{-e^{-x}}$ $\frac{-\infty}{-\infty}$

$\lim_{x\to -\infty} \frac{2}{e^{-x}}$

0

7. $\lim_{x\to\infty} e^{-x}\sqrt{x}$

$\lim_{x\to\infty} \frac{\sqrt{x}}{e^x}$ $\frac{\infty}{\infty}$

$\lim_{x\to\infty} \frac{\frac{1}{2}x^{-1/2}}{e^x}$ "clean up"

$\lim_{x\to\infty} \frac{1}{2e^x\sqrt{x}}$

0

8. $\lim_{x\to 1} \frac{\arctan x - \pi/4}{x - 1}$ $\frac{0}{0}$

$\lim_{x\to 1} \frac{\frac{1}{1+x^2}}{1}$

$\lim_{x\to 1} \frac{1}{1+x^2}$

$\frac{1}{2}$

Page 6

HOMEWORK

pg 574; 5 - 27 odd, 33, 35