Answer Key 2

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| Page 102:<br>For 3-9, just find the limit.<br>12-34, 37. | Page 125: 35-38, 47, 48, 51, 53, 55, 56, 75 |

**Page 102**

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| 3.<br>$\lim_{x\to5}(4x^2-5x)=\lim_{x\to5}4x^2-\lim_{x\to5}5x=$<br>$4\lim_{x\to5}x^2-5\lim_{x\to5}x=4\cdot5^2-5\cdot5=75$ | 4.<br>$\lim_{x\to-3}(2x^3+6x^2-9)=$<br>$2\lim_{x\to-3}x^3+6\lim_{x\to-3}x^2-\lim_{x\to-3}9=$<br>$2(-3)^3+6(-3)^2-9=-54+54-9$<br>$=-9$ |
| 5.<br>$\lim_{v\to2}(v^2+2v)(2v^3-5)=$<br>$\lim_{v\to2}(v^2+2v)\lim_{v\to2}(2v^3-5)=$<br>$\left[\lim_{v\to2}v^2+2\lim_{v\to2}v\right]\left[2\lim_{v\to2}v^3-\lim_{v\to2}5\right]$<br><br>$[2^2+2\cdot2][2\cdot2^3-5]=8\cdot11=88$ | 6.<br>$\lim_{t\to7}\frac{3t^2+1}{t^2-5t+2}=\frac{\lim_{t\to7}3t^2+1}{\lim_{t\to7}t^2-5t+2}=$<br>$\frac{3\lim_{t\to7}t^2+\lim_{t\to7}1}{\lim_{t\to7}t^2-5\lim_{t\to7}t+\lim_{t\to7}2}=\frac{3\cdot7^2+1}{7^2-5\cdot7+2}$<br>$=\frac{148}{16}=\frac{37}{4}$ |
| 7.<br>$\lim_{u\to-2}\sqrt{9-u^3+2u^2}=$<br>$\sqrt{\lim_{u\to-2}9-u^3+2u^2}=$<br>$\sqrt{\lim_{u\to-2}9-\lim_{u\to-2}u^3+2\lim_{u\to-2}u^2}=$<br>$\sqrt{9--2^3+2\cdot-2^2}=\sqrt{9+8+8}=5$ | 8.<br>$\lim_{x\to3}\sqrt[3]{x+5}\,(2x^2-3x)=$<br>$\left[\lim_{x\to3}\sqrt[3]{x+5}\right]\left[\lim_{x\to3}(2x^2-3x)\right]=$<br>$\left[\sqrt[3]{\lim_{x\to3}x+\lim_{x\to3}5}\right]\left[2\lim_{x\to3}x^2-3\lim_{x\to3}x\right]=$<br>$(\sqrt[3]{8})(9)=18$ |
| 9.<br>$\lim_{t\to-1}\left(\frac{2t^5-t^4}{5t^2+4}\right)^3=$<br>$\left(\frac{2\lim_{t\to-1}t^5-\lim_{t\to-1}t^4}{5\lim_{t\to-1}t^2+\lim_{t\to-1}4}\right)^3=$<br>$\left(\frac{2(-1^5)-(-1^4)}{5(-1^2)+4}\right)^3=\left(\frac{-3}{9}\right)^3=$<br>$\left(-\frac{1}{3}\right)^3=-\frac{1}{27}$ | |

Most of these require you to multiply an A+B factor by A-B or the reverse.

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| 12. 5 | 13. 6 |
| 14. -3 | 15. DNE |
| 16. DNE | 17. 5/7 |
| 18. 11/10 | 19. 9/2 |
| 20. 1/3 | 21. -6 |
| 22. 6 | 23. 1/6 |
| 24. -4 | 25. -1/9 |
| 26. DNE | 27. 1 |
| 28.1 | 29. 1/128 |
| 30. 0 | 31. -1/2 |
| 32. -4/5 | 33. $2x^2$ this is the derivative of $x^3$ |
| 34. $-2x^{-3}$ this is the derivative of $x^{-2}$ | |

37. Note that
$-1 \leq cos(20\pi x) \leq 1$ so we have $-x^2 \leq cos(20\pi x) \leq x^2$

Also note that $\lim_{x\to 0} -x^2 = 0$ and $\lim_{x\to 0} x^2 = 0$
So, by the squeeze theorem $\lim_{x\to 0} x^2 cos(20\pi x) =$

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| 35. 4 | 36. 0 |
| 37. $ln(x)$ | 38. 9 |
| 47. We can form an equation here<br>$4c + 4 = 8 - 2c$<br>So we get $c = 2/3$ | 48.<br>First note that $\lim_{x\to 2} \frac{x^2-4}{x-2} = 4$<br>Now we can get two equations in two unknowns<br>$4a - 2b + 3 = 4$<br>$9a - 3b + 3 = 6 - a + b$<br>Solving these we get $a = \frac{1}{2}$ $and$ $b = \frac{1}{2}$ |
| 51. a)<br>this function can be written<br>$\frac{(x-1)(x+1)(x^2+1)}{x-1}$<br>So, the discontinuity at 1 can be removed. A function that agrees but is continuous at 1 is<br>$f(x) = (x+1)(x^2+1)$ | 51. b)<br>this function can be written<br>$\frac{x(x+1)(x-2)}{x-2}$<br>So, the discontinuity at 2 can be removed. A function that agrees but is continuous at 2 is<br>$f(x) = x(x+1)$ |
| 51.c)<br>The discontinuity at $\pi$ is a jump discontinuity and cannot be removed. | |

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| 53.<br>The function is continuous.<br><br>Also $f(0) = 0$ and $10000 < f(100) < \ 10010$<br><br>So, by the intermediate value theorem there exists a number *c*,<br>0 < *c* < 100 such that *f* (*c*)=1000. |
| 55.<br>If $f(x) = -x^3 + 4x + 1$<br><br>then $f(-1) = -2$<br>and $f(0) = 1$<br><br>Since -2 < 0 < 1 by the intermediate value theorem there exists a number c on the interval (-1,0) such that $f(c) = 0$ |
| 56.<br>Since $ln(x) = x - \sqrt{x}$ we can form the function $f(x) = ln(x) - x + \sqrt{x}$<br><br>then $f(2) = \ \sim .107$<br>and $f(3) = \sim - .159$<br><br>Since -.159 < 0 < .107 by the intermediate value theorem there exists a number c on the interval (-1,0) such that $f(c) = 0$, which is a solution to our equation. |
| 75.<br>Use an altitude scale such that the bottom of the mountain is at height=0 and the top is at height =1.<br>Let *H*(*t*) be the monk's height on the first day at time *t* while ascending.<br>Let *G*(*t*) be his height on the second day at time *t* while descending.<br>Let *D*(*t*) = *G*(*t*)-*H*(*t*)<br>Since *H* and *G* are continuous functions, *D* will be continuous.<br><br>At the start of the second day we have *D*(7AM) = 1.<br>At the end of the second day we have *D*(7PM) = -1.<br><br>So, by the intermediate value theorem there is a time t 7AM<t<7PM such that *D*(*t*) = 0.<br>Clearly with *D*(*t*)=0 *H*(*t*)=*G*(*t*). |