17/20

MATH 31
Unit I – Limits
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No calculators are permitted on this test. Show your work. Total value – 20 marks.

1. Find the following limits:

a. $\lim_{x\to -2} \dfrac{x^2-7x+10}{x^2-4}$

/3 $\lim_{x\to -2} \dfrac{(x-5)(x-2)}{(x+2)(x-2)}$ d'u you need to factor?

$\lim_{x\to -2} \dfrac{-2-5}{-2+2}$

$\lim_{x\to -2} = \dfrac{-7}{0}$ = undefined 1/

b. $\lim_{x\to 3} \dfrac{x^2-9}{x^2+2x-3}$

/3 $\lim_{x\to 3} \dfrac{(x+3)(x-3)}{(x+1)(x-3)}$

2 $\lim_{x\to 3} \dfrac{3+3}{3+1} = \dfrac{6}{4} = \dfrac{3}{2}$ 1/

c. $\lim_{h\to 0} \dfrac{\frac{1}{h-2}+\frac{1}{2}}{h^3+6h}$

/3 $\lim_{h\to 0} \dfrac{\frac{2+(h-2)}{2(h-2)}}{h(h^2+6)}$

$\lim_{h\to 0} \dfrac{1}{2(h-2)} \times \dfrac{1}{(h^2+6)}$

$\lim_{h\to 0} -\frac{1}{4} \times \frac{1}{6} = -\frac{1}{24}$ 1/

d. $\lim_{n\to\infty} \dfrac{3n^4+5n^3+6n^2}{7n+2n^2+3n^4}$

/3 $\lim_{n\to\infty} \dfrac{n^4(3+\frac{5}{n}+\frac{6}{n^2})}{n^4(\frac{7}{n^3}+\frac{2}{n^2}+3)}$

$\lim_{n\to\infty} \dfrac{3+0+0}{0+0+3} = \dfrac{3}{3} = 1$ 1/

e. $\lim_{n\to\infty}\left(-\frac{3}{2}\right)^n$

/2 $\lim_{h\to\infty}\left(-\frac{3}{2}\right)^1 = -\frac{3}{2} \quad \left(-\frac{3}{2}\right)^2 = -\frac{9}{4} \quad \left(-\frac{3}{2}\right)^3 = -\frac{27}{8}$

✓ $h = \infty$

2. Find the equation of the tangent line to $y = x^2 - 4x + 3$ at (0, 3)

/4 $f(x) = x^2 - 4x + 3 \quad a = 0$

$f(a) = f(0) = (0)^2 - 4(0) + 3 = 3$

$f(a+h) = (0+h)^2 - 4(0+h) + 3$

$= h^2 - 4h + 3$

$\lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$

$\lim_{h\to 0} \frac{h^2 - 4h + 3 - 3}{h}$

$\lim_{h\to 0} \frac{h(h-4)}{h} = h - 4 = 0 - 4 = -4$

✓ $y - y_0 = m(x - x_0)$

$y - 3 = -4(x - 0)$

$y - 3 = -4x$

$-3 + y = -4x$

$4x + y - 3 = 0$

3. **Either** find the sum of $8 - 12 + 18 - 27 + \ldots$ **or** write 7.272727272… as a fraction

/2 $S_\infty = \frac{a}{1-r}$

$a = 8 \quad r = \frac{-12}{8} = -\frac{3}{2}$

$S_\infty = \frac{8}{1-(-\frac{3}{2})} = \frac{16}{5}$ //

BONUS: Does $\lim_{x\to 0} \frac{|x|}{x}$ exist? Why, or why not? NO. anything divide by 0 doesn't exist