Seungwhan Lee **MAT_284_Spring_2018_Alan**
Assignment HW_10.1 due 02/25/2018 at 11:59pm EST

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1. (1 point) Evaluate the limit

$$\lim_{x\to 7} 8(6x+7)^3$$

If the limit does not exist enter DNE.
Limit = ____________

Correct Answers:

- 941192

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2. (1 point) Evaluate the limit

$$\lim_{x\to -2} \sqrt{25-5x}$$

If the limit does not exist enter DNE.
Limit = ____________

Correct Answers:

- 5.91607978309962

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3. (1 point) Evaluate the limit

$$\lim_{x\to -3} \frac{5x^2-5x+7}{x-4}$$

If the limit does not exist enter DNE.
Limit = ____________

Correct Answers:

- -9.57142857142857

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4. (1 point) Evaluate the limit

$$\lim_{x\to -3} \frac{x^2+7x+12}{x+3}$$

If the limit does not exist enter DNE.
Limit = ____________

Correct Answers:

- 1

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5. (1 point) Let $\lim_{x\to a} h(x) = 0$, $\lim_{x\to a} f(x) = -4$, $\lim_{x\to a} g(x) = -9$.

Find following limits if they exist. If not, enter DNE ('does not exist') as your answer.

___1. $\lim_{x\to a}(h(x)+f(x))$
___2. $\lim_{x\to a}(h(x)-f(x))$
___3. $\lim_{x\to a} h(x)\cdot g(x)$
___4. $\lim_{x\to a} \frac{h(x)}{f(x)}$
___5. $\lim_{x\to a} \frac{h(x)}{g(x)}$
___6. $\lim_{x\to a} \frac{g(x)}{h(x)}$
___7. $\lim_{x\to a} \sqrt{f(x)}$
___8. $\lim_{x\to a} \frac{1}{f(x)}$
___9. $\lim_{x\to a} \frac{1}{f(x)-g(x)}$

Correct Answers:

- -4
- 4
- 0
- 0
- 0
- DNE
- DNE
- -0.25
- 0.2

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6. (1 point) Evaluate the limit

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

If the limit does not exist enter DNE.
Limit = ____________

Correct Answers:

- 0.166666666666667

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7. (1 point) Given

$$f(x) = 8x^2$$

find the limit

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

(The answer may involve x.)
Limit = __________
Correct Answers:

- 2*8*x

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8. (1 point) Given

$$f(x) = \frac{2}{x}$$

find the limit

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

The answer will involve x, and we assume that $x \neq 0$.
Limit = __________
Correct Answers:

- -2/(x**2)

1. $\lim_{x \to 7} 8(6x+7)^3$. Evaluate the limit

sol) $\lim_{x \to 7} 8(6x+7)^3 = 8 \lim_{x \to 7} (6x+7)^3 = 8(6 \cdot 7+7)^3 = 8(117649) = \boxed{941192}$

2. $\lim_{x \to -2} \sqrt{25-5x}$. Evaluate the limit

sol) $\sqrt{\lim_{x \to -2} (25-5x)} = \sqrt{(25+10)} = \boxed{\sqrt{35}}$

3. $\lim_{x \to -3} \dfrac{5x^2-5x+7}{x-4}$. Evaluate the limit

sol) $\dfrac{\lim_{x \to 3} (5x^2-5x+7)}{\lim_{x \to -3} (x-4)} = \dfrac{(5(-3)^2 - 5(-3) + 7)}{(-3-4)} = \boxed{-67/7}$

4. $\lim_{x \to -3} \frac{x^2+7x+12}{x+3}$

sol) $\dfrac{\lim_{x \to -3} (x^2+7x+12)}{\boxed{\lim_{x \to -3} (x+3)}}$ → Denominator is 0, then we need factoring

$\lim_{x \to -3} \frac{(x+4)\cancel{(x+3)}}{\cancel{(x+3)}} = \lim_{x \to -3} (x+4) = (-3+4) \boxed{=1}$

5. (1 point) Let $\lim_{x\to a} h(x) = 0$, $\lim_{x\to a} f(x) = -4$, $\lim_{x\to a} g(x) = -9$.

Find following limits if they exist. If not, enter DNE ('does not exist') as your answer.

___1. $\lim_{x\to a}(h(x)+f(x))$

___2. $\lim_{x\to a}(h(x)-f(x))$

___3. $\lim_{x\to a} h(x)\cdot g(x)$

___4. $\lim_{x\to a} \frac{h(x)}{f(x)}$

___5. $\lim_{x\to a} \frac{h(x)}{g(x)}$

___6. $\lim_{x\to a} \frac{g(x)}{h(x)}$

___7. $\lim_{x\to a} \sqrt{f(x)}$

___8. $\lim_{x\to a} \frac{1}{f(x)}$

___9. $\lim_{x\to a} \frac{1}{f(x)-g(x)}$

Correct Answers:

① $\lim_{x\to a} h(x) + \lim_{x\to a} f(x) = 0 + (-4) \boxed{=-4}$

② $\lim_{x\to a} h(x) - \lim_{x\to a} f(x) = 0 - (-4) \boxed{=4}$

③ $\lim_{x\to a} h(x) \cdot \lim_{x\to a} g(x) = 0 \cdot (-9) \boxed{=0}$

④ $\dfrac{\lim_{x\to a} h(x)}{\lim_{x\to a} f(x)} = \dfrac{0}{-4} \boxed{=0}$

⑤ $\dfrac{\lim_{x\to a} h(x)}{\lim_{x\to a} g(x)} = \dfrac{0}{-9} \boxed{=0}$

⑥ $\dfrac{\lim_{x\to a} g(x)}{\lim_{x\to a} h(x)} = \dfrac{-9}{0} \boxed{=\text{DNE}}$

⑦ $\sqrt{\lim_{x\to a} f(x)} = \sqrt{-4} = 4i$

→ Imaginary Number.

⇒ D.N.E

⑧ $\dfrac{\lim_{x\to a} (1)}{\lim_{x\to a} f(x)} = \dfrac{1}{-4} = \boxed{-\frac{1}{4}}$

⑨ $\dfrac{\lim_{x\to a} (1)}{\lim_{x\to a} f(x) - \lim_{x\to a} g(x)} = \boxed{\frac{1}{5}}$

6. $\lim_{x \to 6} \frac{x-6}{x^2-6x}$. Evaluate the limits

sol) $\frac{\lim_{x \to 6} (x-6)}{\lim_{x \to 6} (x^2-6x)}$ ← Denominator is 0. It is 0/0 form

↳ Factoring : $\lim_{x \to 6} \frac{\cancel{(x-6)}}{x\cancel{(x-6)}} = \lim_{x \to 6} \frac{1}{x} = \frac{\lim_{x \to 6} (1)}{\lim_{x \to 6} (x)} \boxed{= 1/6}$

7. Given $f(x) = 8x^2$. Find the limit $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

sol) $\begin{cases} f(x) = 8x^2 \\ f(x+h) = 8(x+h)^2 \end{cases}$

$$\lim_{h \to 0} \frac{8(x+h)^2 - 8x^2}{h} = \lim_{h \to 0} \frac{8(x^2 + 2hx + h^2) - 8x^2}{h} = \lim_{h \to 0} \frac{\cancel{8x^2} + 16hx + 8h^2 - \cancel{8x^2}}{h}$$

$$= \lim_{h \to 0} \frac{16hx + 8h^2}{h} = \lim_{h \to 0} \frac{8\cancel{h}(h + 2x)}{\cancel{h}} = 8 \lim_{h \to 0} (h+2x)$$

$$= 8\left[\lim_{h \to 0} (h) + 2\lim_{h \to 0} (x)\right] = 8(2x) \boxed{= 16x}$$

8. Given $f(x) = \frac{2}{x}$. Find the limit $\lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$

sol) $\begin{cases} f(x) = \frac{2}{x} \\ f(x+h) = \frac{2}{x+h} \end{cases}$

$$\rightarrow \lim_{h\to 0} \frac{\frac{2}{x+h} - \frac{2}{x}}{h} = \lim_{h\to 0} \frac{\frac{\cancel{2x} - 2(\cancel{x}+h)}{x(x+h)}}{h} = \lim_{h\to 0} \frac{\frac{-2\cancel{h}}{x(x+h)}}{\cancel{h}}$$

$$= \lim_{h\to 0} \frac{-2}{x(x+h)} = -2\left(\lim_{h\to 0} \frac{1}{x^2+xh}\right)$$

$$= -2\left(\frac{\lim_{h\to 0}(1)}{\lim_{h\to 0}(x^2) + \lim_{h\to 0}(xh)}\right) = -2\left(\frac{1}{x^2}\right) = \boxed{-2/x^2}$$