1. $A = P\left(1+\frac{r}{n}\right)^{nt}$ Present Value

1 Math 1325 homework 5t[illegible]

011218

$$300{,}000 = P\left(1+\frac{.08}{1}\right)^{1(25)}$$

$$300{,}000 = P(1+.08)^{25}$$

$$300000 = P(1.08)^{25}$$

$$\frac{300000}{(1.08)^{25}} = \frac{P\cancel{(1.08)^{25}}}{\cancel{(1.08)^{25}}}$$

$$\frac{300000}{(1.08)^{25}} = P$$

$$300000/\left((1.08)^{25}\right) = P$$

$$43{,}805.37147 = P$$

OR Round

$$43{,}805.37 = P$$

(2) $A(t) = A_0 e^{-0.0164t}$

Find Half-Life

(2)

$100 = 200 e^{-0.0164t}$

$A_0 = 200$

Half

$\frac{1}{2}(200) = 100$

$\frac{100}{200} = \frac{200 e^{-0.0164t}}{200}$

$\frac{1}{2} = e^{-0.0164t}$

$\ln\left(\frac{1}{2}\right) = \ln\left(e^{-0.0164t}\right)$

$\ln\left(\frac{1}{2}\right) = -0.0164t \ln(e)$

$\ln\left(\frac{1}{2}\right) = -0.0164t(1)$

$\ln\left(\frac{1}{2}\right) = -0.0164t$

$\frac{\ln\left(\frac{1}{2}\right)}{-0.0164} = \frac{\cancel{-0.0164}t}{\cancel{-0.0164}}$

$42.26507199 = t$

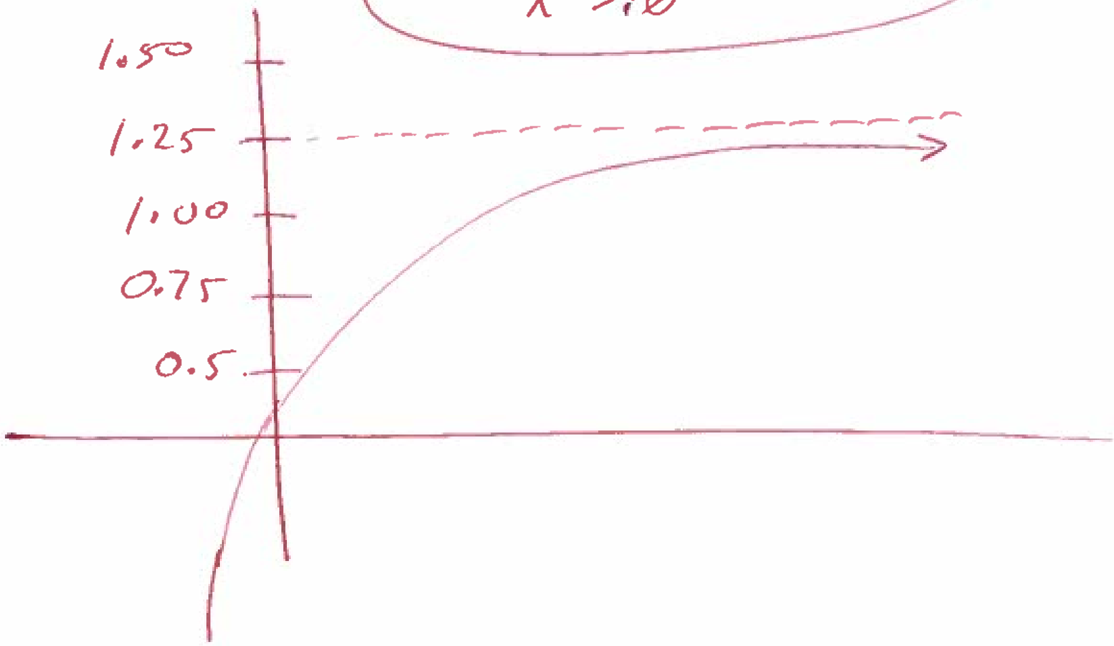
OR Round

$42.3 = t$

3

3

$$\lim_{x \to \infty} f(x)$$



$$\lim_{x \to \infty} f(x) = 1.25$$

8 $\lim_{x \to 6} f(x) = 25$ and $\lim_{x \to 6} g(x) = 23$

8

$$\lim_{x \to 6} [f(x) - g(x)] =$$

$$\lim_{x \to 6} [f(x)] - \lim_{x \to 6} [g(x)] =$$

$$(25) - (23) =$$

$$25 - 23 =$$

$$2 =$$

9.

$$\lim_{x \to 9} \frac{x^2 - 2x - 63}{x - 9} =$$

$$\lim_{x \to 9} \frac{(x+7)(x-9)}{(x-9)} =$$

$$\lim_{x \to 9} \frac{(x+7)\cancel{(x-9)}}{\cancel{(x-9)}} =$$

$$\lim_{x \to 9} (x+7) =$$

$$9 + 7 =$$

$$16 =$$

9.

⑩ $\lim_{h \to 0} \dfrac{\frac{6}{7+h} - \frac{6}{7}}{h}$

p.

$\lim_{h \to 0} \left(\dfrac{\frac{6}{7+h} - \frac{6}{7}}{h} \right) \dfrac{\frac{7(7+h)}{1}}{\frac{7(7+h)}{1}} =$

$\lim_{h \to 0} \dfrac{\left(\frac{6}{\cancel{7+h}}\right)\left(\frac{7\cancel{(7+h)}}{1}\right) - \frac{6}{\cancel{7}}\left(\frac{\cancel{7}(7+h)}{1}\right)}{\frac{h}{1}\ \frac{7(7+h)}{1}} =$

$\lim_{h \to 0} \dfrac{6(7) - 6(7+h)}{h(7)(7+h)} =$

$\lim_{h \to 0} \dfrac{\cancel{42} - \cancel{42} - 6h}{h(7)(7+h)} =$

$\lim_{h \to 0} \dfrac{-6\cancel{h}}{\cancel{h}(7)(7+h)} =$

$\lim_{h \to 0} \dfrac{-6}{(7)(7+h)} =$

$\dfrac{-6}{(7)(7+0)} =$

$\dfrac{-6}{7(7)} =$ $\dfrac{-6}{49}$

(11.) $\lim_{x \to 16} \frac{\sqrt{x}-4}{x-16} =$

$\lim_{x \to 16} \left(\frac{\sqrt{x}-4}{x-16}\right)\left(\frac{\sqrt{x}+4}{\sqrt{x}+4}\right) =$ Mult

11.

$\lim_{x \to 16} \frac{(\sqrt{x})^2+4\sqrt{x}-4\sqrt{x}-16}{(x-16)(\sqrt{x}+4)} =$

$\lim_{x \to 16} \frac{x+\cancel{4\sqrt{x}}-\cancel{4\sqrt{x}}-16}{(x-16)(\sqrt{x}+4)} =$

$\lim_{x \to 16} \frac{\cancel{(x-16)}}{\cancel{(x-16)}(\sqrt{x}+4)} =$

$\lim_{x \to 16} \frac{1}{(\sqrt{x}+4)} =$

$\frac{1}{\sqrt{16}+4} =$

$\frac{1}{4+4} =$

$\frac{1}{8} =$

12. $\lim_{x \to \infty} \frac{7x}{2x-1} =$

$\lim_{x \to \infty} \left(\frac{7x}{2x-1}\right) \frac{\frac{1}{x}}{\frac{1}{x}} =$

$\lim_{x \to \infty} \left(\frac{\frac{7x}{x}}{\frac{2x}{x} - \frac{1}{x}}\right) =$

$\lim_{x \to \infty} \left(\frac{7}{2 - \frac{1}{x}}\right) =$

$\frac{7}{2-0} =$

$\frac{7}{2} =$

formula

$\lim_{x \to \infty} \frac{1}{x} = 0$

12

(13) $\lim_{x \to \infty} \frac{2x^2+2x}{4x^2-4x+1} =$

13

$\lim_{x \to \infty} \left(\frac{2x^2+2x}{4x^2-4x+1}\right) \frac{\frac{1}{x^2}}{\frac{1}{x^2}} =$ Mult

~~Formula~~

$\lim_{x \to \infty} \left(\frac{\frac{2x^2}{x^2} + \frac{2x}{x^2}}{\frac{4x^2}{x^2} - \frac{4x}{x^2} + \frac{1}{x^2}}\right) =$

$\lim_{x \to \infty} \frac{1}{x^n} = 0$

$\lim_{x \to \infty} \left(\frac{2 + \frac{2}{x}}{4 - \frac{4}{x} + \frac{1}{x^2}}\right)$

$\frac{2+0}{4-0+0} =$

$\frac{2}{4} =$

$\frac{\cancel{2}(1)}{\cancel{2}(2)} =$

$\frac{1}{2} =$

(14.) $\lim_{x \to -6} \frac{x^2-36}{x+6} =$

14.

$\lim_{x \to -6} \frac{(x)^2-(6)^2}{x+6} =$

$\lim_{x \to -6} \frac{(x+6)(x-6)}{(x+6)} =$

$\lim_{x \to -6} \frac{\cancel{(x+6)}(x-6)}{\cancel{(x+6)}} =$

$\lim_{x \to -6} (x-6) =$

$-6-6 =$

-12

15. $\lim_{x \to 4} \frac{x^2+4x-32}{x^2-16} =$

15

$\lim_{x \to 4} \frac{(x-4)(x+8)}{(x)^2-(4)^2} =$

$\lim_{x \to 4} \frac{\cancel{(x-4)}(x+8)}{(x+4)\cancel{(x-4)}} =$

$\lim_{x \to 4} \frac{x+8}{x+4} =$

$\frac{4+8}{4+4} =$

$\frac{12}{8} =$

$\frac{\cancel{4}(3)}{\cancel{4}(2)} =$

$\frac{3}{2} =$

OR

$1.5 =$

$$\begin{array}{r} 1.5 \\ 2\,\overline{)\,3.0} \\ -(2) \\ \hline 1.0 \\ -(10) \\ \hline 0 \end{array}$$

16. Find the average rate of change $f(t) = t^2 + 5t - 3$ over 1 to 2.

16

$$\frac{f(2) - f(1)}{(2) - (1)} =$$

$$\frac{((2)^2 + 5(2) - 3) - ((1)^2 + 5(1) - 3)}{(2) - (1)} =$$

$$\frac{(4 + 10 - 3) - (1 + 5 - 3)}{2 - 1} =$$

$$\frac{(11) - (3)}{2 - 1} =$$

$$\frac{11 - 3}{2 - 1} =$$

$$\frac{8}{1} =$$

$$8 =$$

(17) find the average rate of change

Let

$f(x) = y = \sqrt{3x-2}$ between $x=1$ and $x=2$.

(17)

$$\frac{f(2) - f(1)}{(2)-(1)} =$$

$$\frac{(\sqrt{3(2)-2}) - (\sqrt{3(1)-2})}{(2)-(1)} =$$

$$\frac{(\sqrt{6-2}) - (\sqrt{3-2})}{(2)-(1)} =$$

$$\frac{(\sqrt{4}) - (\sqrt{1})}{2-1} =$$

$$\frac{(2) - (1)}{2-1} =$$

$$\frac{2-1}{2-1} =$$

$$\frac{1}{1} =$$

$$1 =$$

(18) Find the average rate of change

$f(x) = y = \sqrt{5x+1}$ between $x=0$ and $x=3$

$$\frac{f(3) - f(0)}{(3) - (0)} =$$

18

$$\frac{(\sqrt{5(3)+1}) - (\sqrt{5(0)+1})}{(3) - (0)} =$$

$$\frac{(\sqrt{15+1}) - (\sqrt{0+1})}{(3) - (0)} =$$

$$\frac{(\sqrt{16}) - (\sqrt{1})}{(3) - (0)} =$$

$$\frac{(4) - (1)}{3 - 0} =$$

$$\frac{4 - 1}{3 - 0} =$$

$$\frac{3}{3} =$$

$$1 =$$

(19) find the average rate of change

$f(x) = y = e^x$ between $x=2$ and $x=6$

(19)

$$\frac{f(6)-f(2)}{(6)-(2)} =$$

$$\frac{(e^6)-(e^2)}{6-2} =$$

$$\frac{403.4287935 - 7.389056099}{6-2} =$$

$$\frac{396.0397374}{4} =$$

$$99.00993435 =$$

OR Round

$$99.0099$$

20. find the instantaneous velocity when $x=5$

$f(x) = 3x^2+4x+2$

$$\lim_{h\to 0} \frac{f(5+h)-f(5)}{(5+h)-(5)} =$$

20.

$$\lim_{h\to 0} \frac{f(5+h)-f(5)}{\cancel{5}+h-\cancel{5}} =$$

$$\lim_{h\to 0} \frac{f(5+h)-f(5)}{h} =$$

$$\lim_{h\to 0} \frac{(3(5+h)^2+4(5+h)+2)-(3(5)^2+4(5)+2)}{h}$$

$$\lim_{h\to 0} \left(\frac{3(5+h)(5+h)+4(5+h)+2)-(3(25)+4(5)+2)}{h}\right.$$

$$\lim_{h\to 0} \left(\frac{3(25+5h+5h+h^2)+20+4h+2)-(75+20+2)}{h}\right.$$

$$\lim_{h\to 0} \frac{(3(25+10h+h^2)+20+4h+2)-(97)}{}$$

$$\lim_{h\to 0} \frac{\cancel{75}+30h+3h^2+\cancel{20}+4h+\cancel{2}-\cancel{97}}{h}$$

$$\lim_{h\to 0} \frac{30h+3h^2+4h}{h}$$

$$\lim_{h\to 0} \frac{34h+3h^2}{h} = \lim_{h\to 0} 34+3h = 34+3(0)$$

$= 34+0$

$= 34$

(25) use definition of the derivative find $f'(x)$ $f'(1)$, $f'(2)$, $f'(3)$.

$f(x) = -x^2 + 4x - 3$

25.

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

$$\lim_{h \to 0} \frac{(-(x+h)^2 + 4(x+h) - 3) - (-x^2 + 4x - 3)}{h} =$$

$$\lim_{h \to 0} \frac{-(x+h)(x+h) + 4x + 4h - 3 + x^2 - 4x + 3}{h} =$$

$$\lim_{h \to 0} \frac{-(x^2 + xh + xh + h^2) + 4x + 4h - 3 + x^2 - 4x + 3}{h} =$$

$$\lim_{h \to 0} \frac{-(x^2 + 2xh + h^2) + 4x + 4h - 3 + x^2 - 4x + 3}{h} =$$

$$\lim_{h \to 0} \frac{\cancel{-x^2} - 2xh - h^2 \cancel{+4x} + 4h \cancel{-3} \cancel{+x^2} \cancel{-4x} \cancel{+3}}{h} =$$

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

$$\lim_{h \to 0} -2x - h + 4 =$$

$-2x - (0) + 4 =$

$-2x + 4$

$f'(x) = -2x + 4$

$f'(3) = -2(3) + 4$

$f'(3) = -6 + 4$

$f'(3) = -2$

$f'(1) = -2(1) + 4 = -2 + 4 = 2$

$f'(2) = -2(2) + 4 = -4 + 4 = 0$

26. use definition of the derivative find $f'(x)$, $f'(-2)$, $f'(0)$, $f'(3)$.

26.

$f(x) = \frac{16}{x}$

$$\lim_{h\to 0} \frac{\left(\frac{16}{x+h}\right) - \left(\frac{16}{x}\right)}{h} =$$

$$\lim_{h\to 0} \frac{\left(\left(\frac{16}{x+h}\right) - \left(\frac{16}{x}\right)\right)\left(x(x+h)\right)}{h\,(x)(x+h)} = \text{Mult}$$

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

$$\lim_{h\to 0} \frac{16(x) - 16(x+h)}{h(x)(x+h)} =$$

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

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

$$\lim_{h\to 0} \frac{-16}{(x)(x+h)} =$$

$$\frac{-16}{x(x+0)} =$$

$$\frac{-16}{x(x)} =$$

$$\frac{-16}{x^2}$$

$$f'(x) = \frac{-16}{x^2}$$

$$f'(-2) = \frac{-16}{(-2)^2} = \frac{-16}{4} = -4$$

$$f'(0) = \frac{-16}{(0)^2} = \frac{-16}{0} = \text{undefined}$$

$$f'(3) = \frac{-16}{(3)^2} = \frac{-16}{9}$$

(27) Find $g'(x)$, $g'(-3)$, $g'(0)$, $g'(2)$.

27

$g(x) = \sqrt{14x}$

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

$$\lim_{h \to 0} \frac{\left(\sqrt{14(x+h)}\right) - \left(\sqrt{14x}\right)}{h} =$$

$$\lim_{h \to 0} \frac{\left(\sqrt{14(x+h)} - \sqrt{14x}\right)\left(\sqrt{14(x+h)} + \sqrt{14x}\right)}{h\left(\sqrt{14(x+h)} + \sqrt{14x}\right)} =$$

$$\lim_{h \to 0} \frac{\left(\sqrt{14(x+h)}\right)^2 + \cancel{\sqrt{14(x+h)}\sqrt{14x}} - \cancel{\sqrt{14x}\sqrt{14(x+h)}} - \left(\sqrt{14x}\right)^2}{h\left(\sqrt{14(x+h)} + \sqrt{14x}\right)}$$

$$\lim_{h \to 0} \frac{(14(x+h)) - (14x)}{h\left(\sqrt{14(x+h)} + \sqrt{14x}\right)}$$

$$\lim_{h \to 0} \frac{\cancel{14x} + 14h - \cancel{14x}}{h\left(\sqrt{14(x+h)} + \sqrt{14x}\right)}$$

$$\lim_{h \to 0} \frac{14\cancel{h}}{\cancel{h}\left(\sqrt{14(x+h)} + \sqrt{14x}\right)}$$

$$\lim_{h \to 0} \frac{14}{\sqrt{14(x+h)} + \sqrt{14x}}$$

$$\frac{14}{\sqrt{14(x+0)} + \sqrt{14x}} =$$

$$\frac{14}{\sqrt{14(x)} + \sqrt{14x}} =$$

$$\frac{14}{1\sqrt{14x} + 1\sqrt{14x}}$$

$$\frac{14}{2\sqrt{14x}} = \frac{\cancel{2}(7)}{\cancel{2}\sqrt{14x}} =$$

$$g'(x) = \frac{7}{\sqrt{14x}}$$

$g'(-3) = \dfrac{7}{\sqrt{14(-3)}} =$ undefined ✓

$g'(0) = \dfrac{7}{\sqrt{14(0)}} =$ undefined ✓

$g'(2) = \dfrac{7}{\sqrt{14(2)}} = \dfrac{7}{\sqrt{28}} = \dfrac{7}{\sqrt{4 \cdot 7}} = \dfrac{7}{2\sqrt{7}}$

28. $y = x^3 - 8x^2 + 5x + 1$

$y' = 3x^{3-1} - 8(2x^{2-1}) + 5(1) + 0$

$y' = 3x^2 - 8(2x^1) + 5 + 0$

$y' = 3x^2 - 16x + 5$

formula

$f(x) = c$

$f'(x) = 0$

$f(x) = x^n$

$f'(x) = nx^{n-1}$

$f(x) = cx$

$f'(x) = c$

25

(29) $y = x^3 - \frac{x^2}{28} + 8x + 7$

(29)

$y = x^3 - \frac{1}{28} x^2 + 8x + 7$

$y' = 3x^{3-1} - \frac{1}{28}(2x^{2-1}) + 8(1) + 0$

$y' = 3x^2 - \frac{1}{28}(2x^1) + 8 + 0$

$y' = 3x^2 - \frac{2}{28}x + 8$

$y' = 3x^2 - \frac{2(1)}{2(14)}x + 8$

$y' = 3x^2 - \frac{1}{14}x + 8$

formula $f(x) = c$, $f'(x) = 0$

$f(x) = cx$, $f'(x) = c$

$f(x) = x^n$ $f'(x) = nx^{n-1}$

30

$y = 13x^2 - 8x - 9x^{-2}$

30

$y' = 13(2x^{2-1}) - 8(1) - 9(-2x^{-2-1})$

$y' = 13(2x^1) - 8 - 9(-2x^{-3})$

$y' = 26x - 8 + 18x^{-3}$

OR

$y' = 26x - 8 + \frac{18}{x^3}$

formulas

$f(x) = c$, $f'(x) = 0$

$f(x) = cx$, $f'(x) = c$

$f(x) = x^n$ $f'(x) = nx^{n-1}$

31. $y = \frac{9}{x^7} - \frac{9}{x}$

31

$y = 9x^{-7} - 9x^{-1}$

$y' = 9(-7x^{-7-1}) - 9(-1x^{-1-1})$

$y' = 9(-7x^{-8}) - 9(-1x^{-2})$

$y' = -63x^{-8} + 9x^{-2}$

$y' = \frac{-63}{x^8} + \frac{9}{x^2}$

Formula

$f(x) = c, \; f'(x) = 0$

$f(x) = cx, \; f'(x) = c$

$f(x) = x^n, \; f'(x) = nx^{n-1}$

32. $y = \frac{4x^5 + 6}{x^3}$

32.

$$y = \frac{4x^5}{x^3} + \frac{6}{x^3}$$

$$y = 4x^{5-3} + 6x^{-3}$$

$$y = 4x^2 + 6x^{-3}$$

$$y' = 4(2x^{2-1}) + 6(-3x^{-3-1})$$

$$y' = 4(2x^1) + 6(-3x^{-4})$$

$$y' = 8x - 18x^{-4}$$

$$y' = 8x - \frac{18}{x^4}$$

Formulas

$f(x) = c \quad f'(x) = 0$

$f(x) = cx \quad f'(x) = c$

$f(x) = x^n \quad f'(x) = nx^{n-1}$

33 find $f'(-4)$

33

$f(x) = \frac{x^4}{7} - 9x$

$f(x) = \frac{1}{7}x^4 - 9x$

$f'(x) = \frac{1}{7}(4x^{4-1}) - 9(1)$

$f'(x) = \frac{1}{7}(4x^3) - 9$

$f'(x) = \frac{4x^3}{7} - 9$

$f'(-4) = \frac{4(-4)^3}{7} - 9$

$f'(-4) = \frac{4(-4)(-4)(-4)}{7} - 9$

$f'(-4) = \frac{-256}{7} - \frac{9}{1}$

$f'(-4) = \frac{-256}{7} - \frac{9}{1}\left(\frac{7}{7}\right)$

$f'(-4) = \frac{-256}{7} - \frac{63}{7}$

$f'(-4) = \frac{-256-63}{7}$

$f'(-4) = \frac{-319}{7}$

34) Find the slope of the tangent line to the graph of the given function at the given value of x. Find the equation of the tangent line.

34

$f(x) = y = x^4 - 2x^3 + 7$

$f(1) = (1)^4 - 2(1)^3 + 7 = 1 - 2(1) + 7 = 1 - 2 + 7 = 6$

$(1, 6)$
$x_1 \quad y_1$

$f(x) = x^4 - 2x^3 + 7$

$f'(x) = 4x^{4-1} - 2(3x^{3-1}) + 0$

$f'(x) = 4x^3 - 2(3x^2)$

$f'(x) = 4x^3 - 6x^2$

$f'(1) = 4(1)^3 - 6(1)^2 = 4(1) - 6(1) = 4 - 6 = -2$

$f'(1) = -2 = \text{slope} = m$

$y - y_1 = m(x - x_1)$

$y - (6) = -2(x - (1))$

$y - 6 = -2(x - 1)$

$y - 6 = -2x + 2$

$y - 6 + 6 = -2x + 2 + 6$

$y = -2x + 8$

Equation of the tangent line