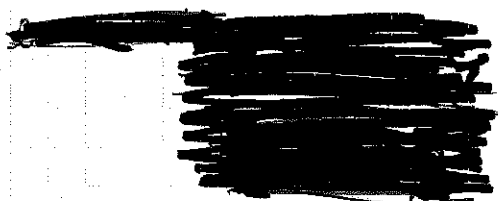


MATH 130 - EXAM 1 - FALL 2014 - Boyle - Solutions

① (a) $(-\infty, 5)$

(b) -4

(c) $\ln x + \ln(3x) = -1 \rightarrow \ln(3x^2) = -1$



$3x^2 = e^{-1} = \frac{1}{e}$

$x^2 = \frac{1}{3e}$

$x = \sqrt{\frac{1}{3e}}$

or $x = \frac{1}{\sqrt{3e}}$

2 (a) $16^{2x+1} = 64^{x-2}$

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

$2^{8x+4} = 2^{6x-12}$

$8x+4 = 6x-12$

$2x = -16$

$x = -8$

(b) population $y = (1.06)^t y_0$ (t in years)

$= y_0 e^{(\ln(1.06))t}$

doubling time is sdn. t to $2 = e^{(\ln(1.06))t}$

" " = $\frac{\ln 2}{\ln 1.06}$ years

3 (a) $\frac{1}{\sqrt{2}}$

(b) $\frac{\pi}{4}$ and $\frac{5\pi}{4}$

(c) amplitude = $\frac{1}{2}$ period = $\frac{1}{3}$

4 (a) 1

(b) $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{x + 2} = \lim_{x \rightarrow -2} \frac{(x+2)(x-3)}{(x+2)} = -5$

(c) E (Note, $e^{-a(s-h)/E} = e^{-s(a/E)}$ and $\lim_{s \rightarrow \infty} e^{-s(a/E)} = 0$.) $\frac{a/h}{E}$ e positive number

5(a) DNE (the one-sided limits, $\lim_{x \rightarrow 1^-}$ and $\lim_{x \rightarrow 1^+}$, are different)

(b) 0

$$(c) \lim_{x \rightarrow -\infty} \frac{3x^3 + 10x^2 - 1}{4x^2 + 5x + 2} = \lim_{x \rightarrow -\infty} \frac{3x^3}{4x^2} = \lim_{x \rightarrow -\infty} \frac{3x}{4} = \boxed{-\infty}$$

$$6(a) \frac{s(2) - s(0)}{2 - 0} = \frac{(5(2)^2 + 3(2) + 2) - (0)}{2} = \frac{28}{2}$$

$$\boxed{14 \text{ ft/sec}}$$

$$(b) s'(t) = 10t + 3 \quad s'(2) = \boxed{23 \text{ ft/sec}}$$

$$7(a) y = \frac{6}{\sqrt{x}} = 6x^{-1/2}$$

$$y' = 6 \left(-\frac{1}{2}\right) x^{-1/2-1} = \blacksquare = -3x^{-3/2} = -3 \left(\frac{1}{\sqrt{x}}\right)^3$$

$$\text{At } x=4, \text{ this is } \blacksquare -3 \left(\frac{1}{2}\right)^3 = \boxed{-\frac{3}{8}}$$

$$(b) y = x^3 + \frac{1}{x} + 1 = x^3 + x^{-1} + 1$$

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

$$\text{when } x=1, y' = 3 - 1 = 2$$

$$\text{Eqn for tangent line: } \boxed{y = 3 + 2(x-1)}$$

at (1,3)

$$\text{or } \boxed{y = 2x + 1}$$

$$8. \text{ area } A = \pi r^2$$

$$A'(r) = 2\pi r$$

$$\text{Change in area} = A(1.8) - A(2)$$

$$\approx A'(2)(1.8 - 2)$$

$$= 4\pi(-0.2) = \boxed{-0.8\pi \text{ mm}^2}$$