Math 10250 Exam 1 Solution

1. $m = \dfrac{e^2-1}{e-1} = \dfrac{(e-1)(e+1)}{e-1} = e+1$

2. $f(x) = 3x^2-12x+16 = 3(x^2-4x)+16 = 3(x^2-4x+4)+16-12 = 3(x-2)^2+4$. $a+k = 3+4 = 7$.

3. $(x+3)/(x^2+1)$ has horizontal asym y = 0. $(x^2+1)/(x+3)$ has vertical asym. x = -3. $(x^2+1)/(3x^2-8)$ has horizontal asym. y = 1/3. e^x has horizontal asym. y = 0.

4. $\lim_{t\to\infty} P(t) = 7/2 = 3.5$ millions.

5. $x \geq 0$ and $x \neq -1$. Therefore,$x \geq 0$.

6. $f(-1)$, $f(0)$ have opposite signs. Also $f(1)$, $f(2)$ have opposite signs.

7. $200,000 = 50,000e^{2r}, \Rightarrow 4 = e^{2r}, \Rightarrow \ln 4 = 2r, \Rightarrow r = \frac{1}{2}\ln 4$. $y(t) = 50,000e^{\frac{t}{2}\ln 4} = 50,000e^{\ln 2^t} = 50,0002^t$.

8. $10,000 = y_0e^{0.035*10}, \Rightarrow y_0 = 10,000e^{-0.35}$.

9. $\dfrac{y_0}{2} = y_0e^{-0.0004*t} \Rightarrow \dfrac{1}{2} = e^{-0.0004*t} \Rightarrow \ln\dfrac{1}{2} = \ln e^{-0.0004t}$
$\Rightarrow \ln 2 = 0.0004t \ \Rightarrow t = \frac{\ln 2}{0.0004}$.

10. $\log_5\sqrt{625A^3} = \dfrac{1}{2}(\log_5 5^4 + \log_5 A^3) = \dfrac{1}{2}(4\log_5 5 + 3\log_5 A) = \dfrac{1}{2}(4+3\cdot 20) = 32$.

11. (a). $\text{Cost}(x) = 5x+1200$.
    (b). $\text{Rev}(x) = 7x-(5x+1200) = 2x-1200$.
    (c). Break-even $\text{Rev}(x) = 0$. $x = 600$.

12. (a). x = -2 and 2.
    (b). x = 1 and 0.

13.

14. (a). $1000 = P_0(1+\frac{0.05}{12})^{12\cdot 10}. \Rightarrow P_0 = 1000(1+\frac{0.05}{12})^{-120}$.
    (b). $15000 = 5000e^{20r} \Rightarrow 3 = e^{20r} \Rightarrow \ln 3 = 20r \Rightarrow r = \frac{\ln 3}{20}$.

15. (a). $\lim_{x\to 1}\dfrac{x^2+x-2}{x-1} = \dfrac{(x-1)(x+2)}{x-1} = \lim_{x\to 1} x+2 = 3. \Rightarrow c = 3$.
    (b). $\ln(2x-1) = 3 \Rightarrow 2x-1 = e^3 \Rightarrow x = \dfrac{e^3+1}{2}$.