ANSWERS

ÇANKAYA UNIVERSITY

Department of Mathematics

**MATH 107 - Mathematics For Business and Economics I**

# MIDTERM 1

**STUDENT NUMBER:**

**NAME-SURNAME:**

**SIGNATURE:**

**INSTRUCTOR:**

**DURATION:** 75 minutes

| Question | Grade | Out of |
|---|---|---|
| 1 | | 20 |
| 2 | | 20 |
| 3 | | 20 |
| 4 | | 20 |
| 5 | | 20 |
| Total | | 100 |

**IMPORTANT NOTES:**

**1)** Please make sure that you have written your student number and name above.

**2)** Check that the exam paper contains 5 problems.

**3)** Show all your work. No points will be given to correct answers without reasonable work.

**1) a)** Find domain of $f(x) = \log(x^2 - 1)$.

$x^2 - 1 > 0$

$x^2 > 1$

$\Rightarrow x \in (-\infty, -1) \cup (1, \infty)$

**b)** Solve $x^2 - 8x - 33 = 0$.

$x = \frac{8 \pm \sqrt{8^2 + 4 \cdot 33}}{2}$

$= \frac{8 \pm \sqrt{196}}{2}$

$x = \frac{8 \pm 14}{2}$

$x = 11$ or $x = -3$

**c)** Find an equation of the line that is passing through $(3, -1)$ and parallel to $2x + 5y - 1 = 0$.

$y = \frac{-2x + 1}{5} \Rightarrow m = -\frac{2}{5}$

$y - (-1) = -\frac{2}{5}(x - 3)$

$\Rightarrow y = -\frac{2}{5}x + \frac{1}{5}$

**d)** Solve the inequality $2 + \sqrt{x - 3} > 7$.

$\sqrt{x - 3} > 5$

$x - 3 > 25$

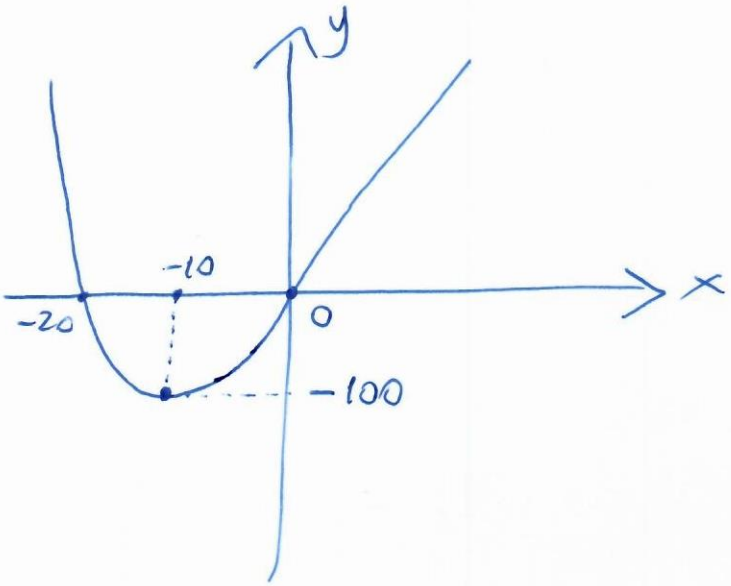
$x > 28$

**2) a)** Sketch the parabola $f(x) = x^2 + 20x$.

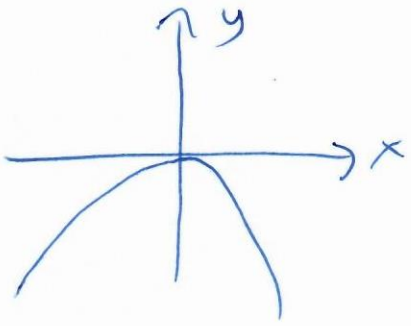
$x = 0 \Rightarrow y = 0$

$y = 0 \Rightarrow x = 0$ or $x = -20$

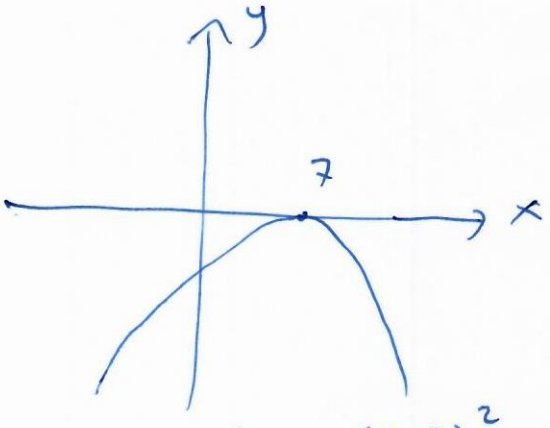
Vertex: $(-10, -100)$




**b)** Sketch the parabola $f(x) = -(x-7)^2 - 11$.

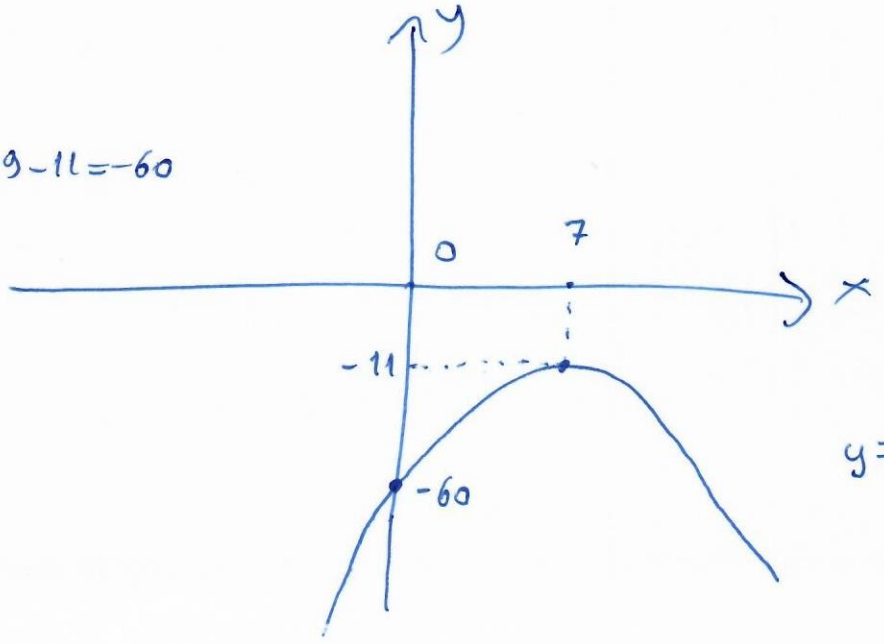



$y = -x^2$




$y = -(x-7)^2$

$f(0) = -49 - 11 = -60$




$y = -(x-7)^2 - 11$

**3)** For this question, find solutions by using calculator.

**a)** Solve the equation $(1-4x)^3 = 0.68$.

$$1-4x = 0.68^{1/3}$$

$$x = \frac{1-0.68^{1/3}}{4}$$

$$= 0.0302$$

**b)** Solve the equation $4(7^x - 15) = 1$.

$$7^x = 15 + \frac{1}{4} = \frac{61}{4}$$

$$x \ln 7 = \ln 61 - \ln 4$$

$$x = 1.4002$$

**c)** Solve the equation $\ln(3+7x) = \frac{1}{5}$.

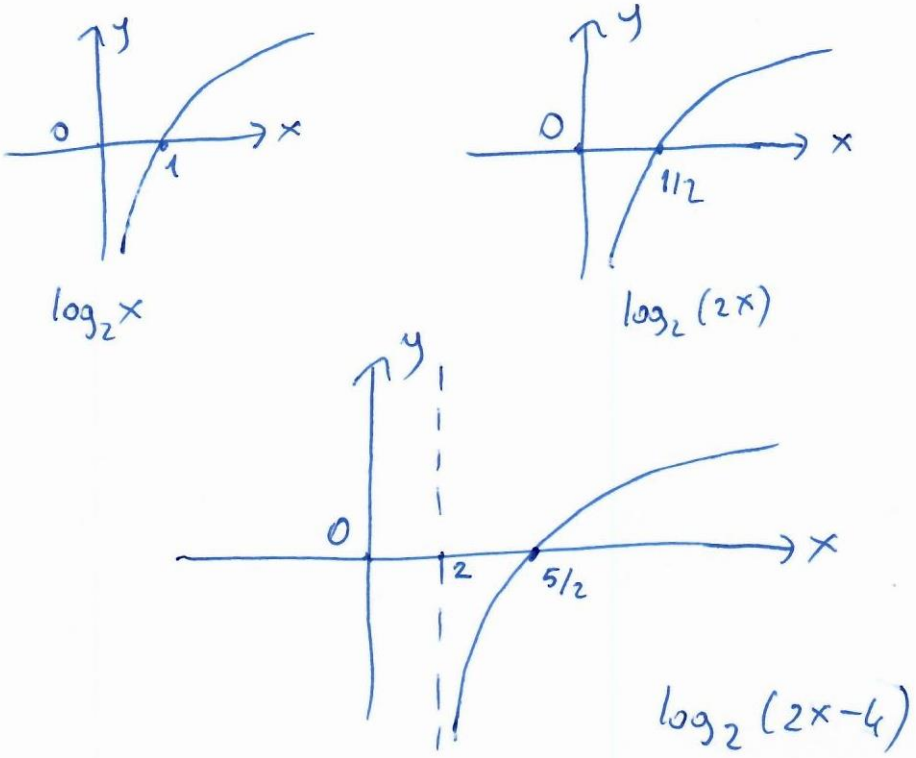
$$3 + 7x = e^{1/5}$$

$$7x = e^{1/5} - 3$$

$$x = \frac{e^{1/5} - 3}{7}$$

$$= -0.2541$$

**4) a)** Sketch $f(x) = \log_2(2x - 4)$.




**b)** We invest \$400 to an account paying 5% compounded quarterly. How much money will we have after 6 years? (Use calculator!)

$$A = 400\left(1 + \frac{0.05}{4}\right)^{24}$$

$$\cong 538.94$$

5) For this question, find solutions by using calculator. This question contains two unrelated parts.

**a)** You invest \$1000 into a bank account with 3% nominal interest rate. How long will it take the value to amount to \$2000 if it is compounded semiannually?

$$2000 = 1000\left(1+\frac{0.03}{2}\right)^{2t}$$

$$2 = 1.015^{2t}$$

$$\ln 2 = 2t \ln 1.015$$

$$t = \frac{\ln 2}{2\ln(1.015)}$$

$$\cong 23.27 \text{ years}$$

**b)** What interest rate is required for \$1500 to amount to \$2500 in 3 years compounded monthly?

$$2500 = 1500\left(1+\frac{r}{12}\right)^{36}$$

$$\frac{5}{3} = \left(1+\frac{r}{12}\right)^{36}$$

$$1+\frac{r}{12} = \left(\frac{5}{3}\right)^{1/36}$$

$$r = \left[\left(\frac{5}{3}\right)^{1/36} - 1\right] 12$$

$$\approx 0.1716$$

$$r \approx 17.16\,\%$$