MA 161 ONLINE, SUMMER 2026
Quiz 1: §1.3, 1.4

Name: Key
PUID:

Score: /~~30~~ 20
Length: 15 minutes

Directions: Follow these instructions carefully. Failure to do so may result in your quiz being invalidated and/or an academic integrity violation. All suspected violations of academic integrity will be reported to the Office of the Dean of Students.

- Complete each question below. There are 3 questions; the maximum score is 10 points.
- You have 25 minutes: 15 minutes to complete the quiz and ~~10~~ 5 minutes to upload it to Gradescope. 20
- This quiz is closed book and closed notes. Calculators are not allowed.
- You are to work independently. External help (including, but not limited to, using the internet and generative AI) is prohibited.
- You may use your own paper to complete this quiz; you do not need to print this document.
- Adequate work must be shown for each problem. A question with little to no work, even with a correct answer, will result in a low score.
- Make sure your work is neat and legible, especially after it is scanned. Use proper notation, and clearly mark the question numbers and your final answer. Points may be taken off if part of your work is unreadable.

(The questions start on the next page, one problem per page)

6

1. [5 points] The function $A(t) = 100e^{0.05t}$ models the amount of money in a bank account t years after an initial investment of \$100. How long does it take for the investment to double? (Write an exact answer, do not round.)

$$100e^{0.05t} \overset{\text{set}}{=} 2 \cdot 100$$

$$e^{0.05t} = 2$$

$$\ln(e^{0.05t}) = \ln(2)$$

$$0.05t = \ln(2)$$

$$t = \frac{\ln(2)}{0.05} \text{ years}$$

2. [8 points] Determine the amplitude and period of the wave $f(t) = 3\cos(4t - 2\pi) + 1$. Graph one period of $f(t)$ starting at $t = \frac{\pi}{2}$.

$$f(t) = \underbrace{3}_{\text{Amplitude}} \cos\Big(\underbrace{4}_{\text{Horizontal Squish by a factor of 4}}\Big(t - \underbrace{\tfrac{\pi}{2}}_{\text{Shift Right by } \frac{\pi}{2}}\Big)\Big) + \underbrace{1}_{\text{shift up by 1}}$$

Determine Period (P):

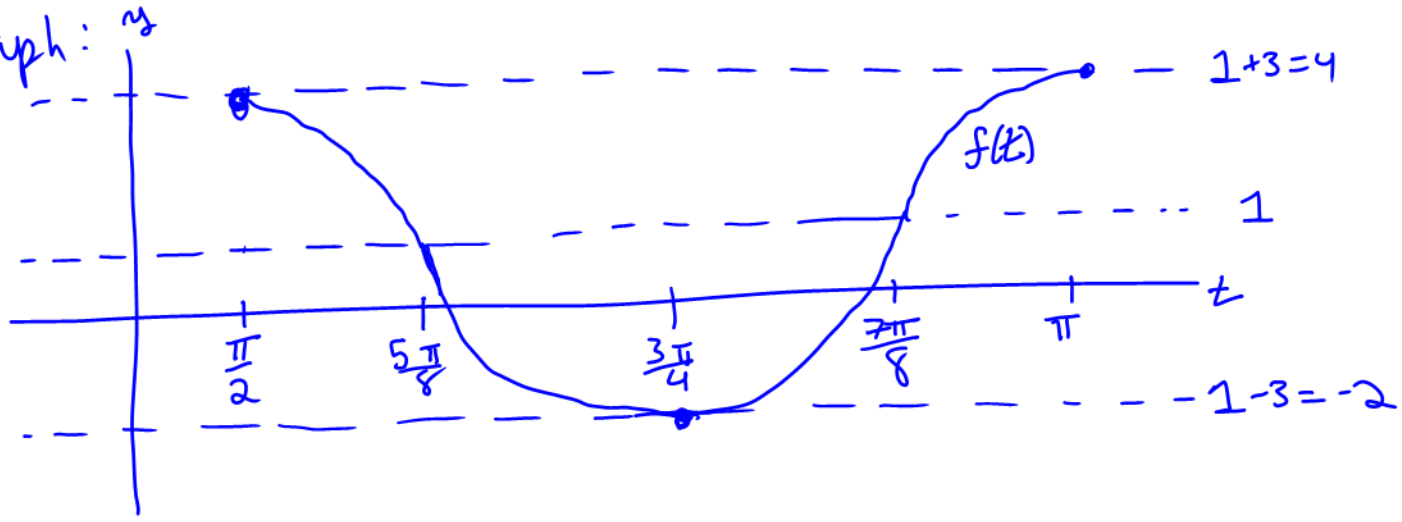
$$\frac{2\pi}{P} = 4 \Rightarrow P = \frac{\pi}{2}$$

t-values of interest on $\left[\frac{\pi}{2}, \frac{\pi}{2} + P\right] = \left[\frac{\pi}{2}, \pi\right]$

$$\Delta t = \frac{P}{4} = \frac{\pi}{8}$$

$$t \in \left\{\tfrac{\pi}{2}, \tfrac{\pi}{2} + \Delta t, \tfrac{\pi}{2} + 2\Delta t, \tfrac{\pi}{2} + 3\Delta t, \tfrac{\pi}{2} + 4\Delta t\right\} = \left\{\tfrac{\pi}{2}, \tfrac{3\pi}{8}, \tfrac{3\pi}{4}, \tfrac{7\pi}{8}, \pi\right\}$$

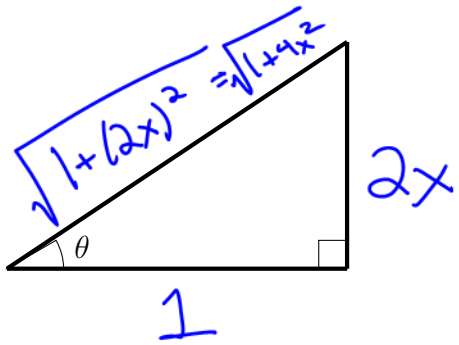
Graph:



3. [6 points] Let $\theta = \tan^{-1}(2x)$, where x is a positive number. Write the side lengths of the right triangle below as expressions of x; use the right triangle to simplify $\sin(\tan^{-1}(2x))$.

$\theta = \tan^{-1}(2x)$

$\Rightarrow \tan\theta = \frac{2x}{1}$ ← opposite, ↖ Adjacent



So,

$$\sin(\tan^{-1}(2x)) = \sin\theta = \frac{\text{opp}}{\text{hyp}} = \frac{2x}{\sqrt{1+4x^2}}$$